



Service Manual

Aneroid Sphygmomanometers

95P504 Rev. D

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Revision Information

Date	ECN#/ ECO#	Revision	Description	Author	Approved
8/31/00		A	Introduction of Aneroid Service Manual	JDB	
5/15/01		B	Corrected tolerance levels in the gauge tests sections. Corrected minor grammatical errors.	JDB	
8/18/03	5-46368	C	Correction of tooling part numbers. Arden document release to SKF.	WWR	DLK
5/27/04	1000873	D	Corrected BOM, tooling and procedures.	BSW	RJS

Drawings and/or illustrations and/or part numbers in this document are for reference only. For the most current revision call the Welch Allyn Customer Service phone number listed in Section 1.

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To Service Personnel

The information contained in this publication is subject to change without notice and should not be construed as a commitment by Welch Allyn, Inc.

Welch Allyn assumes no responsibility for any errors that may appear in this manual. If the product and/or its operation varies significantly from any description herein, please contact the following:

Welch Allyn, Inc.
1-800-535-6663
315-685-4100
Fax (315)-685-3361

Welch Allyn, Inc.
4341 State Street Road
Skaneateles Falls, NY 13153-0220
USA

This product has been designed to provide a high degree of safety and reliability. However, we can not guarantee against: deterioration of components due to aging, normal wear, tampering, and abuse.

Only Authorized Welch Allyn personnel or agents must perform all service and repairs, using approved Welch Allyn replacement parts and approved process materials. Failure to follow these guidelines will invalidate the product warranty. Please refer to the product warranty for specific coverage.

Intent of Manual and Product Scope

This manual provides technical service and re-calibration information to technicians authorized to repair and re-calibrate Welch Allyn, Inc. products. When used in conjunction with the required test equipment and tools, technicians will be able to diagnose, repair, re-calibrate, and test the Aneroid Sphygmomanometer.

The manual includes: re-calibration instructions, fault/cause analysis, step-by-step disassembly and re-assembly procedures, repair, adjustment, and re-test procedures.

Limited Warranty

Welch Allyn, Inc. warrants the Aneroid Sphygmomanometers when new, to be free of defects in material and workmanship and to perform in accordance with manufacturer's specifications for a period of (see **Table 1-1**) from the date of purchase from Welch Allyn, Inc. or its authorized distributors or agents. Welch Allyn, Inc. will either repair or replace any components found to be defective or at variance from manufacturer's specifications within this time at no cost to the customer. It shall be the purchaser's responsibility to return the instrument to Welch Allyn, Inc. or an authorized distributor, agent or service representative. This warranty does not include breakage or failure due to tampering, misuse, neglect, accidents, modification or shipping. This warranty is also void if the instrument is not used in accordance with manufacturer's recommendations or if repaired by other than Welch Allyn, Inc. or an authorized agent. Purchase date determines warranty requirements. No other express warranty is given.

To receive service assistance or to ask questions regarding this warranty, please call your nearest Welch Allyn Technical Support Center.

Warranty, Service, and Spare Parts

Warranty Service

All repairs on products under warranty must be performed or approved by Welch Allyn. Unauthorized repairs will void the warranty. In addition, whether or not covered under warranty, any product repair shall exclusively be performed by Welch Allyn trained and certified service personnel.

Assistance and Parts

If the product fails to function properly or if assistance, service, or spare parts are required, contact the nearest Welch Allyn Technical Support Center.

USA 1-800-535-6663	Latin America (+1) 305-669-9591
European Call Center (+353) 469-067-790	United Kingdom 0-207-365-6780
France (+33) 1-60-09-33-66	Germany (+49) 7477-927-173
Canada 1-800-561-8797	South Africa (+27) 11-777-7509
Australia (+61) 2-9638-3000	Singapore (+65) 6291-0882
Japan (+81) 3-5212-7391	China (+86) 21-6327-9631

Before contacting Welch Allyn it is helpful to attempt to duplicate the problem and to check all accessories to ensure that they are not the cause of the problem.

When calling, please be prepared to provide:

- The product name, model number and complete description of the problem
- The serial number of your product (if applicable)
- The complete name, address and phone number of your facility
- For out-of-warranty repairs or spare parts orders, a purchase order (or credit card) number
- The required spare or replacement part number(s), for parts order

Repairs

If your product requires warranty, extended warranty, or non-warranty repair service, first call the nearest Welch Allyn Technical Support Center. A representative will assist you in troubleshooting the problem and will make every effort to solve the problem over the phone, avoiding a potential unnecessary return.

In case the return cannot be avoided, the representative will record all necessary information and will provide a Return Material Authorization (RMA) number, as well as the appropriate return address.

A Return Material Authorization (RMA) number must be obtained prior to any return. Be sure to note this number on the outside of your shipping box.

Packing Instructions

If you have to return goods for service, follow these recommended packing instructions:

- Remove all hoses, and ancillary products (as appropriate) before packing, unless you suspect they are associated with the problem.
- Wherever possible use the original shipping carton and packing materials.
- Include a packing list and the Welch Allyn Return Material Authorization (RMA) number.
- Be sure to note the (RMA) number on the outside of your shipping box.

It is recommended that all returned goods be insured. Claims for loss or damage to the product must be initiated by the sender.

Periodic Calibration Requirements

Welch Allyn sphygmomanometers are manufactured to high standards for quality and accuracy. The instruments are manufactured using calibrated pressure standards traceable to the National Institute of Standards and Technology.

During normal operation, the location of the pointer within the oval/square indicates that the instrument is most likely in calibration. Should the pointer rest outside the oval/box with zero pressure applied, the instrument should be re-calibrated.

Welch Allyn recommends that the calibration of mechanical sphygmomanometers be checked using the following procedures on an annual basis even if the pointer rests inside the oval/box.

1. Connect the instrument under test to a high-quality, known pressure standard (traceable to the National Institute of Standards and Technology) and a 500 cc test volume.
2. Pressurize the gauge to slightly above 300 mmHg and bleed down the pressure no faster than 10 mmHg per second, stopping to check the pressure at 300, 250, 200, 150, 100, 60, and 0 mmHg.
3. Record the readings of the instrument under test and the applied pressure. The difference is the error of the instrument. The error of the reference pressure should be added to the specified accuracy of the instrument under test (± 3 mmHg) to determine the working accuracy of your calibration set-up.

NOTE: *Your ability to measure the accuracy of a sphygmomanometer depends upon the sensitivity of the pressure standard you use for the calibration procedure.*

Example: If using a device (e.g., digital pressure standard) rated at ± 0.1 mmHg, you will be able to determine the accuracy of the gauge being tested to within ± 3.1 mmHg.

*Welch Allyn recommends using a pressure standard that is as sensitive as possible when performing calibration checks. A **Setra Pressure Meter** (part no. 2270-01), which is calibrated for ± 0.1 mmHg, or **Nitech Pressure Meter** (part no. 200-2000IN), which is calibrated for ± 1.0 mmHg, work well for this application.*

New S&K Movement

The S&K movement is now being used in all Classic Hand Aneroid, Classic Pocket Aneroid, Wall Aneroid Series 509, Wall Aneroid Series 767, TR1 Silver Ring and TR2 ProCheck aneroids. The S&K movement looks similar to Figure 1-1. Please familiarize yourself with the different parts of the S&K movement.

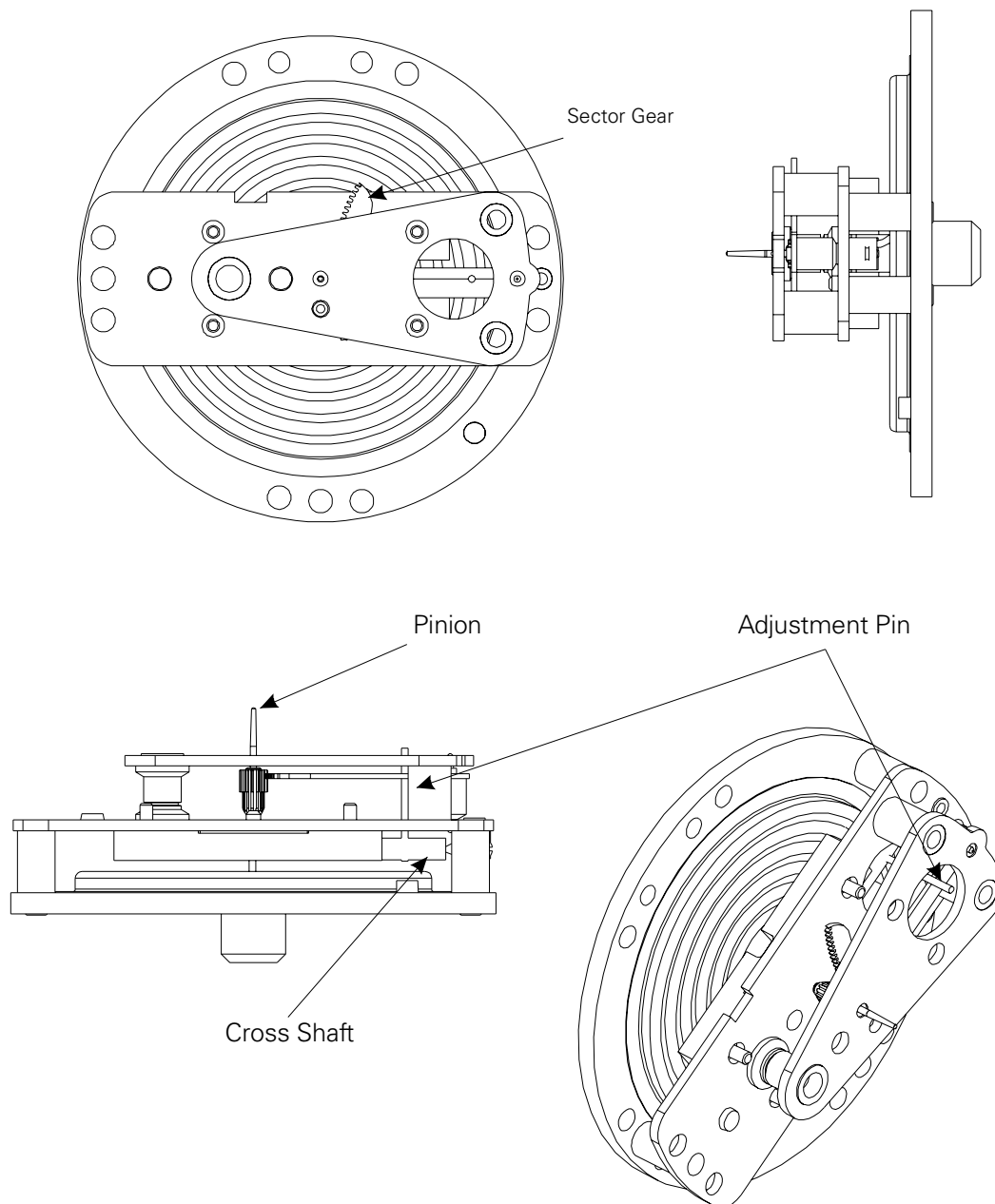


Figure 1-1. New style S&K Movement.

Old Style Movements

Welch Allyn still supports the Older Style Classic Hand Aneroid, Classic Pocket Aneroid, Wall Aneroid Series 509 and Wall Aneroid Series 767. The Older movements look similar to Figure 1-2.

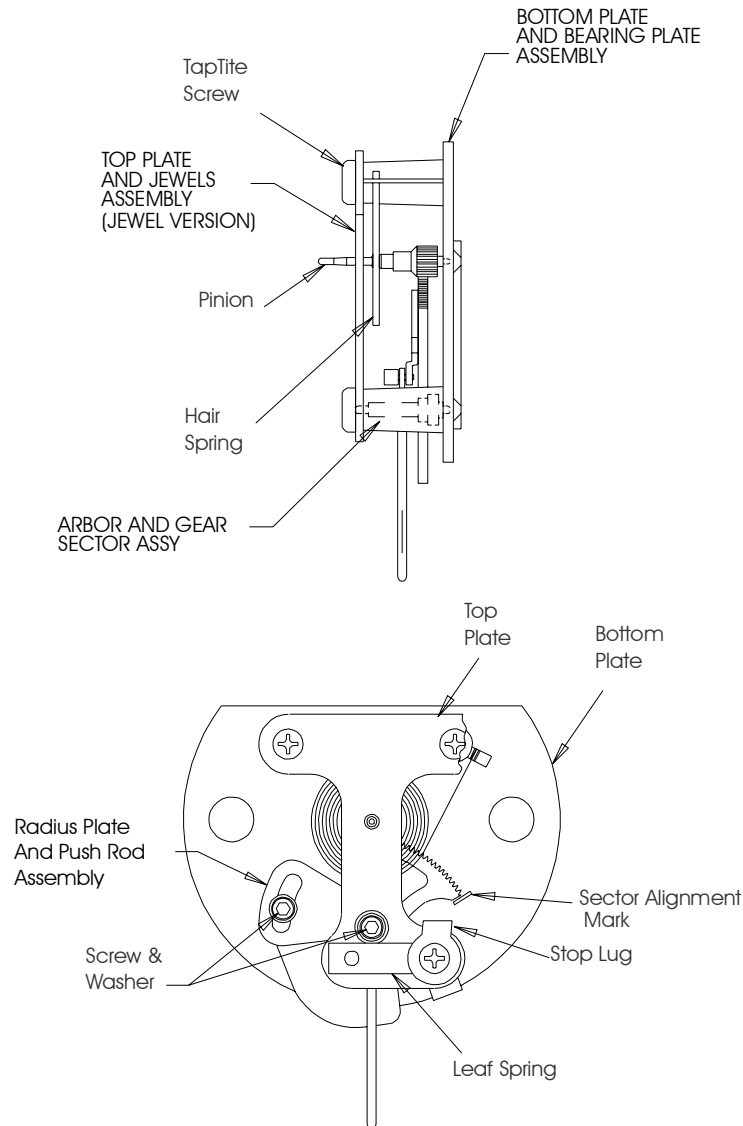


Figure 1-2. Old style aneroid movement.

Table 1-1. Aneroid warranty table.

Model	Model No.	Description	Warranty	Comments
Classic Hand Aneroid	5098-06	w/Infant Cuff	Lifetime	Replace w/S&K Assy.
	5098-05	w/Adult Cuff	Lifetime	Replace w/S&K Assy.
	5098-02	w/Child Cuff	Lifetime	Replace w/S&K Assy.
	5098-20	w/Various Size Cuffs	Lifetime	Replace w/S&K Assy.
	5098-23	w/Various Size Printed Cuffs	Lifetime	Replace w/S&K Assy.
	5098-18	w/Various Printed Ped Cuffs	Lifetime	Replace w/S&K Assy.
Classic Pocket Aneroid	5090-06	w/Child Cuff	Lifetime	Replace w/S&K Assy.
	5090-02	w/Adult Cuff	Lifetime	Replace w/S&K Assy.
	5090-41	w/Lg. Adult Cuff	Lifetime	Replace w/S&K Assy.
	5090-37	w/Thigh Cuff	Lifetime	Replace w/S&K Assy.
Wall Aneroid Series 509	5091-38	w/Adult Cuff	Lifetime	Replace w/S&K Assy.
	5091-22	w/Adult Cuff & Orange Scale	Lifetime	Replace w/S&K Assy.
	5091-60	w/5 legged stand	Lifetime	Replace w/S&K Assy.
	5091-41	w/4 legged stand		
Wall Aneroid 767 Series	7670-01	w/Adult Cuff	Lifetime	Replace w/S&K Assy.
TR1 (Siler Ring) Hand Aneroid	5098-29	w/Child Cuff	10 year	No Change
	5098-27	w/Adult Cuff	10 year	No Change
	5098-28	w/Lg. Adult Cuff	10 year	No Change
	5098-30	w/Various Size Printed Cuffs	10 year	No Change
TR2 (Procheck) Hand Aneroid	5098-72	w/Child Cuff	5 year	No Change
	5098-70	w/Adult Cuff	5 year	No Change
	5098-71	w/Lg. Adult Cuff	5 year	No Change
	5098-73	w/Various Size Printed Cuffs	5 year	No Change
Durashock	DS45-09	w/Child Cuff	10 year	No Change
	DS45-09P	w/Printed Child Cuff	10 year	No Change
	DS45-10	w/Sm. Adult Cuff	10 year	No Change
	DS45-11	w/Adult Cuff	10 year	No Change
	DS45-12	w/Lg. Adult Cuff	10 year	No Change
Durashock	DS44-09	w/Child Cuff	5 year	No Change

Model	Model No.	Description	Warranty	Comments
	DS44-09P	w/Printed Child Cuff	5 year	No Change
	DS44-10	w/Sm. Adult Cuff	5 year	No Change
	DS44-11	w/Adult Cuff	5 year	No Change
	DS44-12	w/Lg. Adult Cuff	5 year	No Change
Arden Wall Aneroid	Arden-W01	Gage & Cuff	5 year	No Change
	Arden-W02	Gage Only	5 year	No Change
Arden Pocket Aneroid	Arden-G01	w/Adult Cuff	5 year	No Change
	Arden-G02	w/Lg. Adult Cuff	5 year	No Change
	Arden-G03	w/Child Cuff	5 year	No Change
	Arden-G04	Gage Only	5 year	No Change
Economy Pocket Aneroid	7050-23	w/Child Cuff	10 year	Discontinue selling after 7/15/2003
	7050-14	w/Adult Cuff	10 year	Discontinue selling after 7/15/2003
	7050-24	w/Lg. Adult Cuff	10 year	Discontinue selling after 7/15/2003
	7050-43	w/Thigh Cuff	10 year	Discontinue selling after 7/15/2003
Mercurial	5097-30	Desk	10 year	Discontinued selling after 3/15/2003
	5097-29	w/Mobile Stand	10 year	Discontinued selling after 3/15/2003
	5097-26	w/Wall Mount	10 year	Discontinued selling after 3/15/2003
	5097-11	w/Wall Mount & Orange Scale	10 year	Discontinued selling after 3/15/2003

Tools Required for Service

Tool Number	Description	Old Style Economy	Old Style Pocket	Old Style Hand	Old Style 509	Old Style 7670	TR-2	TR-1	S&K Hand	S&K Pocket	S&K 509	S&K 7670
Local Tool Store	Tweezers						X					
Local Tool Store	Jewelers Screwdriver		X	X	X							
Local Tool Store	3/8" Open End Wrench			X								
Local Tool Store	Pliers to Grip Luer			X								
Local Tool Store	5/16" Open End Wrench			X								
T112854	500cc Volume	X	X	X	X	X	X	X	X	X	X	X
T106763	509/7670 Fixture				X	X					X	X
T18891	Adapter for Torque wrench						X	X	X	X	X	X
T110657	Calibration Dial	X										
T112663	Calibration Dial				X							
T112949	Calibration Dial						X					
T18781	Calibration Dial								X	X		
T18833	Calibration Dial										X	X
T19036	Calibration Dial							X				
T105721	Calibration Dial		X	X								
T106845A	Calibration Tool	X	X	X	X	X						
T18816	Calibration Tool (S+K)						X	X	X	X	X	X
T105644	Collet		X									
T108212	Economy Gauge Fixture	X										
T107569	Hand Gauge Fixture			X					X			
T108897	Movement Removal Wrench	X	X	X								
T74555	Pocket Gauge Fixture		X							X		
T55804-1	Pocket Screw Cap Assy.		X									
T19034	Pointer Assembly Tool						X	X	X	X	X	X
T34935	Pointer Block	X	X	X	X							
T18814	Pointer Removal Tool	X	X	X	X	X	X	X	X	X	X	X
T19035	S&K removal Wrench						X	X	X	X	X	X
T113249	Screw Cap Removal Tool		X									
T107345	Span Wrench		X									
T119628	Tension Setting Tool	X	X	X	X	X						
T113265	Thumbscrew Wrench			X					X			
T112655	Top Plate Wrench	X	X	X	X							
T112459	Torque Screwdriver				X	X					X	X

Tool Number	Description	Old Style Economy	Old Style Pocket	Old Style Hand	Old Style 509	Old Style 7670	TR-2	TR-1	S&K Hand	S&K Pocket	S&K 509	S&K 7670
T18904	Torque Wrench (S & K)						X	X	X	X	X	X
T112584	TR-1 & TR-2 Fixture						X	X				
T105258	Wrench	X			X	X						
Local Tool Store	Red Loctite #266	X	X	X	X	X	X	X	X	X	X	X
Local Tool Store	3M Plastic Adhesive #1099	X										

Test equipment												
Tool Number	Description	Old Style Economy	Old Style Pocket	Old Style Hand	Old Style 509	Old Style 7670	TR-2	TR-1	S&K Hand	S&K Pocket	S&K 509	S&K 7670
5088-01	Bulb and Valve	X	X		X	X				X	X	X
Gomco 300 or equivlant****	Suction Pump (Must be able to pull a suction of -20 mmHg)						X	X	X	X	X	X
9585TPK4***	"T" Fitting	X	X	X	X	X	X	X	X	X	X	X
9586TPK4***	"Y" Fitting	X	X	X	X	X	X	X	X	X	X	X
97P24	Pneumatic Tubing (4ft.)	X	X	X	X	X	X	X	X	X	X	X
200-2000in*	Netech Digital Pressure Meter	X	X	X	X	X	X	X	X	X	X	X
2270-01**	Setra Digital Pressure Meter	X	X	X	X	X	X	X	X	X	X	X
Local Tool Store	Torque Bit size T5				X	X					X	X
NOTE: Only one of the pressure meters are needed. The user can choose which will work best for them.												
* Order from Netech (800-547-6557)												
* * Order from Setra (800-257-3872)												
* * * Order from Festo (704-527-1427)												
* * * * Order from PMED (303-393-7800)												

Test Specifications

The following are the pressure test points that each gauge must be tested to after any repair is made.

1. The gauge must be accurate to within ± 3 mmHg at the following test pressures:
 - a) 0 mmHg (pointer inside the oval/rectangle)
 - b) 60 mmHg
 - c) 100 mmHg
 - d) 150 mmHg
 - e) 200 mmHg
 - f) 250 mmHg
 - g) 300 mmHg

Note: Calibration of all gauges must be performed using a Calibrated Digital Pressure Meter, traceable to NIST standards, as the pressure standard, to ensure complete accuracy.

Test Equipment Bench Layout

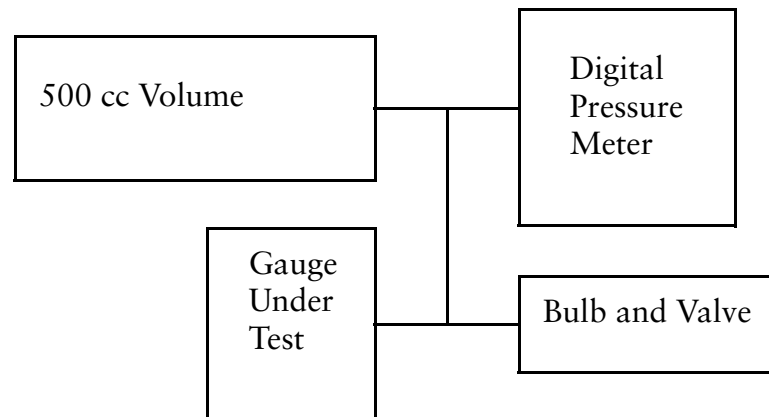


Figure 2-1. Test Equipment Bench layout.

Classic Pocket Aneroid Gauges (Date stamp of September 2003 or earlier)**Initial Gauge Check**

1. Before performing calibration:
 - a) Check the clip for correct tension. Replace before calibration.
 - b) Ensure the lock nut is tight.
 - c) Check the hair spring. Ensure that the hair spring is uniform and not distorted.
 - d) Check the pinion. Ensure that it rotates correctly and is not bent.

Opening/Removing and Replacing Parts of the Classic Pocket Gauge

2. Place the pocket gauge into the Pocket Gauge Fixture (T74555).
3. Remove the bezel by unscrewing it from the case. Remove the crystal.
4. Remove the pointer, using the pointer removal tool (T18814).
5. Pry out the dial, using a small flat head screwdriver.
6. Remove the capsule locking nut using span wrench (T107345).
7. Remove the screw cap, using (T113249). Remove the capsule.
Note: The arm of the movement fits into the top of the capsule.
8. Remove the 2 screws that are holding down the gauge movement using (T108897).
Note: Some units will use phillip head screws to secure the movement.
9. Remove the movement.

Note: Reassemble in reverse order.

Calibration of the Classic Pocket Gauge

10. Connect the gauge to test equipment.
11. Place the gauge in to the pocket fixture (T74555).
12. Remove the bezel, crystal, pointer and dial.

Aligning Sector Gear on the Classic Pocket Gauge

13. View the sector gear and ensure that it is in the proper position. The right edge of the sector gear should align with the mark on the base of the movement.
14. If the sector gear is not aligned properly, loosen the capsule nut using (T107345). Adjust the sector gear by turning the capsule until the sector gear is in the correct position per step #13. Tighten the capsule nut.

Setting the Classic Pocket Gauge Tension

15. Loosen the sector stop lug and pull it towards the bottom of the gauge.
16. Using your left index finger, push the sector gear all the way to the post and hold in that position.
17. Place the tension setting tool (T119628) onto the pinion at the 9 o'clock position.
18. Rotate the tension setting tool clockwise to the 5 o'clock position.
19. Release the sector gear and continue rotating the tension setting tool to the 9 o'clock position. The sector gear should be moving during this step.
20. Bring the sector stop lug back to correct position and lock it into place.

Setting the Classic Pocket Gauge Span

21. Place the test dial (T105721) onto the gauge. Place the test pointer onto the pinion. Rotate the test dial until the pointer is at "0".
22. Apply 320 mmHg to the gauge.
23. Release the pressure to 300 mmHg.
24. If the pointer is pointing to less than "300", place the calibration tool (T106845A) into the radius plate slot above the screw. Rotate the calibration tool counter clockwise towards the bottom of the gauge until the test pointer reaches "300". Release the pressure to 0 mmHg and check at the "0" point.
25. If the test pointer is pointing to greater than "300", position the calibration tool (T106845A) between the sector gear and the radius plate. Rotate the tool clockwise until the pointer is at "300" (this brings the radius plate down). Release the pressure to 0 mmHg and check the "0" point.
26. If the pointer is not at "0" upon full release of pressure, rotate the test dial until the test pointer is on the "0" mark of test dial. Repeat steps 22-25 until span is set.
27. Check for leaks by pinching off the tubing from the test equipment while pressure is applied to the gauge. There should be no leakage or movement of the pointer.

Check and finish the calibration of the Classic Pocket Gauge

28. Remove the test pointer and test dial. Replace the gauge's dial.
29. Apply a small amount of red Loctite #266 to the hub of the pointer. Place the gauge's pointer onto the pinion. Ensure that it is resting in the center of the oval/square. Gently tap the pointer with a small hammer to secure.

30. If the pointer is to the left of the oval/square's center, rotate the pointer counter clockwise until you feel a slight resistance. Release the pointer. Ensure that the pointer returns to the center of the oval/square "0". Repeat until correct.

31. If the pointer is to the right of the oval/square's center, rotate the pointer clockwise until a slight resistance is felt. Release the pointer. Ensure that the pointer returns to the center of the oval/square "0" each time. Repeat until correct.

32. Place the crystal and bezel back onto the gauge. Test the gauge.

33. Connect the gauge to the test equipment.

34. Apply 320 mmHg to the gauge.

35. Release the pressure to 300 mmHg.

Note: *The aneroid gauge must be accurate to ± 3 mmHg at the stated target pressures. Use a calibrated digital pressure meter.*

36. Compare the reading of the calibrated digital pressure meter to that of the gauge under test.

37. The following are the pressure test points that each gauge must be tested to after any repair is made. The gauge must be accurate to within ± 3 mmHg at the following test pressures:

- a) 0 mmHg (pointer inside the oval/rectangle)
- b) 60 mmHg
- c) 100 mmHg
- d) 150 mmHg
- e) 200 mmHg
- f) 250 mmHg
- g) 300 mmHg

Note: *Calibration of all gauges must be performed using a Calibrated Digital Pressure Meter as the pressure standard for complete accuracy.*

Classic Pocket Aneroid Gauges (Date stamp of October 2003 or later)

(With S&K movement)

Initial Gauge Check

1. Before performing calibration:
 - a) Check the gauge for a sticky or jumpy pointer movement.
 - b) Attach gauge to test equipment and test for leaks.
 - c) Check the clip for correct tension. Replace before calibration.

Opening/Removing and Replacing Parts of the Classic Pocket Gauge

2. Place the pocket gauge into the Pocket Gauge Fixture (T74555).
3. Remove the bezel by unscrewing it from the case. Remove the crystal.
4. Remove the pointer by using the pointer removal tool (T18814).
5. Pry out the dial by using a small flat head screwdriver.
6. The pocket end cap cannot be removed.
7. Remove the movement using (T18904).

***Note:** Reassemble in reverse order. Ensure you tighten the movement down with torque wrench (T18904) using adapter (T18891)*

Calibration of the Classic Pocket Gauge

8. Connect the gauge to the test equipment.
9. Place the gauge in to the pocket fixture (T74555).
10. Remove the bezel, crystal, pointer and dial.

Checking the Classic Pocket Gauge Span:

11. Place the test dial (T18781) onto the gauge. Place the test pointer onto the pinion. Rotate the test dial until the pointer is at "0".
12. Apply 320 mmHg to the gauge.
13. Release the pressure to 300 mmHg.
14. Observe the position of the pointer. If the pointer does not align with the "300", go to **Average Zero Starting Position**

15. If the pointer does align with "300", go to **Linearity Adjustment of the Classic Pocket Aneroid**.

Average Zero Starting Position

16. Apply 60 mmHg of pressure to the gauge. Release the pressure to zero. Mentally note where the test pointer is pointing on the test dial.

17. Apply a -20 mmHg of vacuum to the gauge. Release the pressure to zero. Mentally note where the test pointer is pointing on the test dial.

18. Take the average of where the pointer was between step 16 and step 17. Rotate the test dial's zero mark to that averaged position.

Span Adjustment of the Classic Pocket Aneroid

19. Apply 320 mmHg of pressure to the gauge. Bleed down to 300 mmHg. Note the pointer's position and maintain pressure.

20. If the span is too low, using calibration tool (T18816), bend the adjustment pin away from pinion parallel to gear sector arm. See Figure 3-1. Release the pressure to 0. Make sure to re-adjust the test dial so that the pointer will be slightly left of the graduation line. Re-pressurize to 320 mmHg then to 300 mmHg to evaluate the effects of the adjustment.

21. If the span is too high, using calibration tool (T18816), bend the adjustment pin towards the pinion parallel to the gear sector arm. See Figure 3-1. Release the pressure to 0. Make sure to re-adjust the test dial so that the pointer will be slightly left of the graduation line. Re-pressurize to 320 mmHg then to 300 mmHg to evaluate effects of adjustment.

22. Repeat the above steps as required to obtain correct span adjustment.

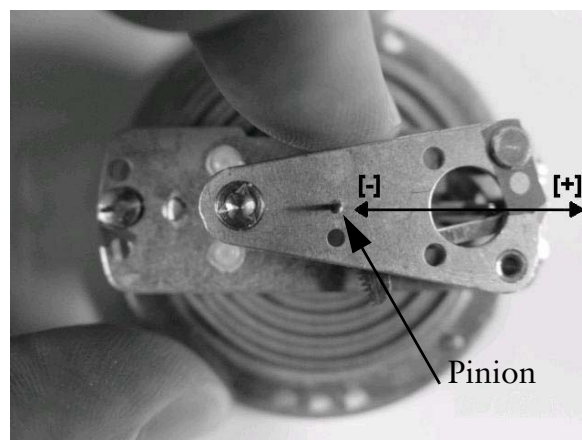


Figure 3-1. S&K span adjustment.

Linearity Adjustment of the Classic Pocket Aneroid: (As required)

Note: If the 0 mmHg and 300 mmHg position are correct, and the other points at 250 mmHg or 60 mmHg are either too high or too low, perform the following adjustments.

High Readings of the Classic Pocket Aneroid: (Predominantly at 250 and 200)

23. Remove the test pointer and test dial. Position the calibration tool (T18816) over the adjusting pin and push it down to the cross shaft. **Note:** You may have to move the gear sector with your finger of other hand to allow the calibration tool to slide down to the cross shaft.

24. Move the hook away from the diaphragm (approximately 15 degrees), by pushing on the sector gear. While maintaining this position, lift the tool up from cross shaft approximately 1/16 inch and bend the pin back approximately 15 degrees. See Figure 3-2. Lift the calibration tool up to the point where the pin makes contact with the gear sector and bend the pin up, approximately 30 degrees.

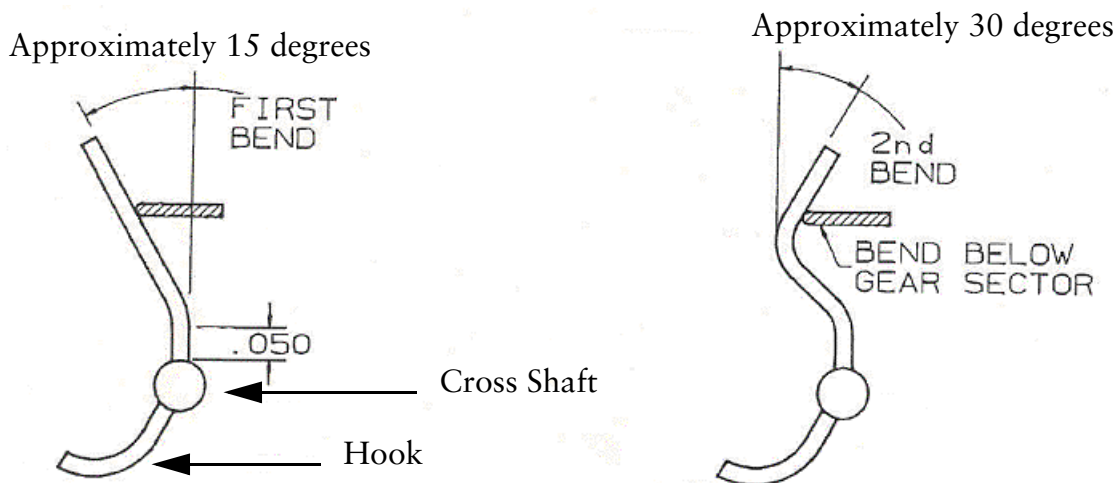


Figure 3-2. S&K pin adjustment if reading is high at 250 mmHg.

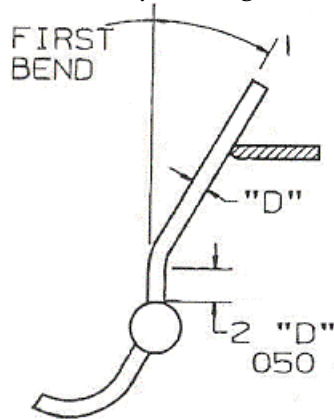
25. Remove the tool and release the gear sector. The resultant bend should result in the gear sector starting position being a maximum of 2 teeth extending beyond the top plate when viewed from a top position and a minimum of 2 teeth within the edge of the top plate. (This must be checked by pushing the gear sector 2 teeth from the other side of the top plate). Adjust the secondary bend if the gear sector is out of these limits. Re-assemble the test dial and test pointer. Recheck span and adjust as necessary prior to inspecting the intermediate points.

Low Readings of the Classic Pocket Aneroid at 60 or 100:

26. Remove the test pointer and test dial. Position the calibration tool over the adjusting pin and push it down to the cross shaft. Lift the tool approximately 1/16 inch and bend the pin approximately 15 degrees. See Figure 3-3. While maintaining this position, lift the tool

to point where the pin makes contact with the gear sector. Bend the pin down 30 degrees. Remove the tool and release the gear sector. Check for gear sector starting position as defined previously. Adjust if necessary. Re-assemble the test dial and test pointer. Recheck the span and adjust as necessary prior to inspection at the intermediate points.

Approximately 15 degrees



Approximately 30 degrees

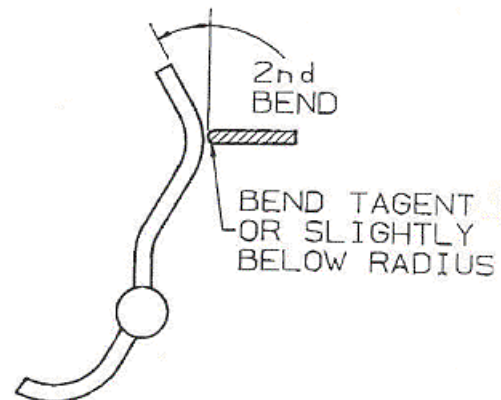


Figure 3-3. S&K pin adjustment if reading is low at 60 mmHg.

Note: In all adjustments during calibration, the gear sector starting position will affect accuracy. Sometimes, this alone can be used as an individual adjustment to achieve conformance. Higher readings will be realized when the gear sector is extending beyond the edge of the top plate and lower readings will be realized when it is within the edge of the top plate.

27. Check for leaks by pinching off the tubing from the test equipment while pressure is applied to the gauge. There should be no leakage or movement of the pointer.

Check and finish the calibration of the Classic Pocket Gauge

28. Remove the test pointer and test dial. Replace the gauge's dial.

29. Apply a small amount of red Loctite #266 to the hub of the pointer. Place the gauge's pointer onto the pinion. Ensure that it is resting in the center of the oval. Gently tap the pointer with small hammer to secure or use (T19034) pointer assembly tool.

30. Place the crystal and bezel back onto the gauge and test the gauge.

Testing the Classic Pocket Gauge

31. Connect the Pocket Gauge to the test equipment.

32. Apply 320 mmHg to the gauges.

33. Release the pressure to 300 mmHg.

***Note:** The aneroid or mercury gauge must be accurate to ± 3 mmHg at the stated target pressures. Use a calibrated digital pressure meter.*

34. Compare the reading of the calibrated digital pressure meter to that of the Pocket Gauge under test.

35. The following are the pressure test points that each gauge must be tested to after any repair is made. The gauge must be accurate to within ± 3 mmHg at the following test pressures:

- a) 0 mmHg (pointer inside the oval/rectangle)
- b) 60 mmHg
- c) 100 mmHg
- d) 150 mmHg
- e) 200 mmHg
- f) 250 mmHg
- g) 300 mmHg

***Note:** Calibration of all gauges must be performed using a Calibrated Digital Pressure Meter as the pressure standard for complete accuracy.*

Classic Wall and Mobile Aneroid Gauge (Date stamp of July 2003 or earlier)**7670 series Wall and Mobile Aneroid Disassembly**

1. Remove the bezel from the case by prying the 4 tabs up. Pull out on the bezel.
2. Remove the crystal.
3. Remove the pointer by using the pointer removal tool (T18814). Visually inspect and straighten if needed.
4. Remove the screws of the dial by using the torque driver (T112459). Remove the dial.
5. Remove the screws that are holding down the mount to the case of the gauge by using a Phillips head screwdriver.

Note: Reassemble in reverse order.

Classic Wall and Mobile Aneroid Disassembly

6. Remove the crystal by pushing down and out at the top. Remove the crystal.
7. Remove the pointer by using the pointer removal tool (T18814). Inspect and straighten if needed.
8. Remove the dial by removing the screws with the torque driver (T112459).
9. Remove the movement and the mount by unscrewing the standoffs. Remove them from the case.

Note: Reassemble in reverse order.

Calibration of the Wall and Mobile Gauge

Note: Before performing calibration:

- a) *Check the hair spring. Ensure it is uniform and not distorted.*
- b) *The movement should be slow when released.*
- c) *Check the pinion. Ensure that it rotates correctly and is not bent.*

10. Connect the gauge to the test equipment.
11. Remove the bezel, crystal, pointer and dial.

Sector Gear Alignment for the Wall and Mobile Aneroid

13. View the sector gear and ensure proper position. The right edge of the sector gear should align with the mark on the base of the movement.

14. If the sector gear is not aligned properly, loosen the capsule nut using (T105258). Adjust the sector gear by turning the capsule until the sector gear is in the correct position per step 13. Tighten the capsule nut.

Setting the Tension of the Wall and Mobile Aneroid

15. Loosen the sector stop lug and pull it towards the bottom of the gauge.
16. Using your left index finger, push the sector gear all the way to the post and hold that in position.
17. Place the tension setting tool (T119628) onto the pinion at the 9 o'clock position.
18. Rotate the tension setting tool clock wise to the 5 o'clock position.
19. Release the sector gear and continue rotation to the 9 o'clock position. The sector gear should be moving during this step.
20. Bring the lug back to the correct position and lock it into place.

Setting the span of the Wall and Mobile Aneroid

21. Place the test dial (T112641 for 767 Series) or (T112663 for 509 Series) onto the gauge. Place the test pointer onto the pinion. Rotate the test dial until the pointer is at "0".
22. Apply 320 mmHg of pressure to the gauge.
23. Release the pressure to 300 mmHg.
24. If the pointer is pointing to less than "300", place the calibration tool (T106845A) into the radius plate slot above the screw. Rotate the calibration tool counter clockwise towards the bottom of the gauge until the sector gear pointer reaches "300". Release the pressure to 0 mmHg and check at the "0" point.
25. If the pointer is pointing to greater than "300", using the calibration tool (T106845A) positioned between the sector gear and the radius plate. Rotate the tool clockwise until the pointer is at "300" (this brings the radius plate down). Release the pressure to 0 mmHg and check the "0" point.
26. If the pointer is not pointing at "0" upon the release of pressure, rotate the test dial until the pointer is on the "0" mark of test dial. Repeat steps 22-25 until the span is set.
27. Check for leaks by pinching off the tubing from the test equipment while pressure is on the gauge. There should be no visible leak.

Check and finish calibration of the Wall and Mobile Aneroid

28. Remove the test pointer and test dial. Replace the gauge's dial.

29. Apply a small amount of red Loctite #266 to the hub of the pointer. Place the gauge's pointer onto the pinion. Ensure the pointer is resting in center of oval "0". Tap the pointer with small hammer slightly to secure.

30. If the pointer is to the left of the oval/square's center, rotate the pointer counter clockwise until you feel a slight resistance. Release the pointer. Ensure the pointer returns to the center of the oval/square "0". Repeat until correct.

31. If the pointer is to the right of the oval/square's center, rotate the pointer clockwise until a slight resistance is felt. Release the pointer. Ensure the pointer returns to the center of the oval/square "0" each time. Repeat until correct.

32. Place the crystal and perform a full test.

Testing of the Wall and Mobile Aneroid

33. Connect the Wall or Mobile Gauge to the test equipment.

34. Apply 320 mmHg of pressure to the gauge.

35. Release the pressure to 300 mmHg.

36. Compare the reading of wall or mobile gauge under test to a calibrated digital pressure meter.

Test Specifications

37. The following are the pressure test points that each gauge must be tested to after any repair is made. The gauge must be accurate to within ± 3 mmHg at the following test pressures:

- a) 0 mmHg (pointer inside the oval/rectangle)
- b) 60 mmHg
- c) 100 mmHg
- d) 150 mmHg
- e) 200 mmHg
- f) 250 mmHg
- g) 300 mmHg

Note: Calibration of all gauges must be performed using a Calibrated Digital Pressure Meter as the pressure standard for complete accuracy.

Classic Wall and Mobile Aneroid Gauge (Date stamp of October 2003 and later.)

(With S&K movement.)

7670 series Wall and Mobile Aneroid Disassembly

1. Remove the bezel from the case by prying the 4 tabs up. Pull out on the bezel.
2. Remove the crystal.
3. Remove the pointer by using the pointer removal tool (T18814). Visually inspect and straighten if needed.
4. Remove the screws of the dial by using the torque driver (T112594A). Remove the dial.
5. Remove the screws that are holding down the mount to the case of the gauge by using a Phillips head screwdriver.
6. Remove the movement using (T19035).

***Note:** Reassemble in reverse order. Ensure you tighten the movement down with torque wrench (T18904) using adapter (T18891).*

Classic Wall and Mobile Aneroid Disassembly

7. Remove the crystal by pushing down and out at the top. Remove the crystal.
8. Remove the pointer by using the pointer removal tool (T18814). Inspect and straighten if needed.
9. Remove the dial by removing the screws with the torque driver (T112459A).
10. Remove the movement and the mount by unscrewing the standoffs. Remove them from the case.

***Note:** Reassemble in reverse order. Ensure you tighten the movement down with torque wrench (T18904) using adapter (T18891).*

Calibration of the Wall and Mobile Gauge

11. Connect the gauge to the test equipment.
12. Remove the bezel, crystal, pointer and dial.

Checking the Wall/Mobile Gauge Span

13. Place the test dial (T18833) onto the gauge. Place the test pointer onto the pinion. Rotate the test dial until the pointer is at "0".

14. Apply 320 mmHg to the Gauge.
15. Release the pressure to 300 mmHg.
16. Observe the position of the pointer. If the pointer does not align with the "300", go to **Average Zero Starting Position**.
17. If the pointer does align with "300", go to **Linearity Adjustment of the Wall/Mobile Aneroid**.

Average Zero Starting Position

18. Apply 60 mmHg of pressure to the gauge. Release the pressure to zero. Mentally note where the test pointer is pointing on the test dial.
19. Apply a -20 mmHg of vacuum to the gauge. Release the pressure to zero. Mentally note where the test pointer is pointing on the test dial.
20. Take the average of where the pointer was between step 18 and step 19. Rotate the test dial's zero mark to that averaged position.

Span Adjustment of the Wall Aneroid

21. Apply 320 mmHg of pressure to the gage to then bleed down to 300 mmHg. Mentally note position and maintain pressure.
22. If the span is too low, using calibration tool (T18816), bend the adjustment pin away from pinion parallel to gear sector arm. Change pressure to 0 mmHg. Make sure to re-adjust the test dial so that the pointer will be slightly left of the graduation line. Re-pressurize to 320 mmHg then to 300 mmHg to evaluate the effects of the adjustment. See Figure 3-4.
23. If the span is too high, using calibration tool (T18816), bend the adjustment pin towards the pinion parallel to the gear sector when pressurized at 300 mmHg. Change the pressure to 0 mmHg. Make sure to re-adjust the test dial so that the pointer will be slightly left of the graduation line. Re-pressurize to 320 mmHg then to 300 mmHg to evaluate effects of adjustment. See Figure 3-4.
24. Repeat the above steps as required to obtain correct span adjustment.

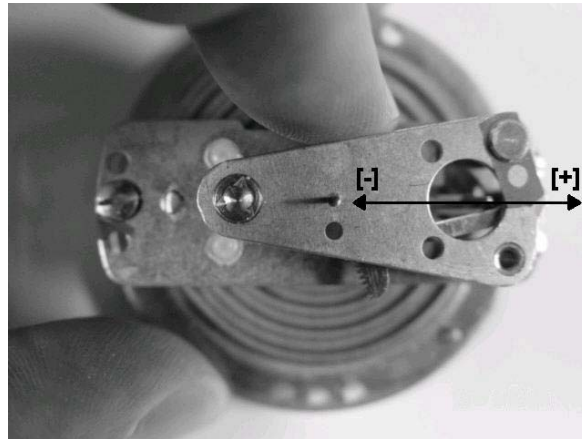


Figure 3-4. S&K span adjustment.

Linearity Adjustment of the Wall/Mobile Aneroid: (As required)

Note: If the 0 mmHg and 300 mmHg position are correct, and the other points at 250 mmHg or 60 mmHg are either too high or too low, then perform the following adjustments.

High Readings of the Wall/Mobile Aneroid: (Predominantly at 250 and 200)

25. Remove the test pointer and test dial. Position the calibration tool (T18816) over the adjusting pin and push it down to the cross shaft. Move the gear sector with your finger of other hand to allow access. Rotate the pin by pushing the sector gear, to move the hook away from the diaphragm (approximately 15 degrees). While maintaining this position, lift the tool up from cross shaft approximately 1/16 inch and bend the pin back approximately 15 degrees. See Figure 3-5. Lift the calibration tool up to the point where the pin makes contact with the gear sector and bend the pin up, approximately 30 degrees.

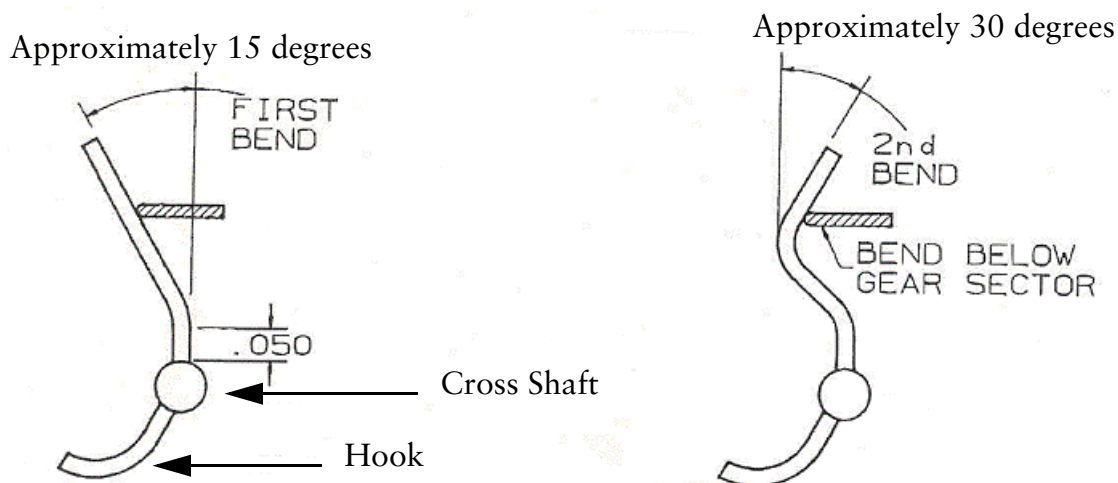


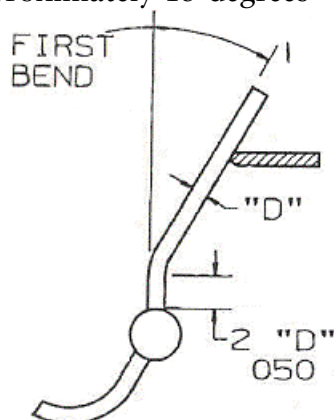
Figure 3-5. S&K pin adjustment if reading is high at 250 mmHg.

26. Remove the tool and release the gear sector. The resultant bend should result in the gear sector starting position being a max. of 2 teeth extending beyond the top plate when viewed from a top position and a minimum of 2 teeth within the edge of the top plate. (This must be checked by pushing the gear sector 2 teeth from the other side of the top plate). Adjust the secondary bend if the gear sector is out of these limits. Re-assemble the test dial and test pointer. Recheck span and adjust as necessary prior to inspecting the intermediate points.

Low Readings of the Wall/Mobile Aneroid at 60 or 100

27. Remove the test pointer and test dial. Position the calibration tool over the adjusting pin and push it down to the cross shaft. Lift the tool approximately 1/16 inch and bend the pin approximately 15 degrees. See Figure 3-6. While maintaining this position, lift the tool to point where the pin makes contact with the gear sector. Bend the pin down 30 degrees. Remove the tool and release the gear sector. Check for gear sector starting position as defined previously. Adjust if necessary. Re-assemble the test dial and test pointer. Recheck the span and adjust as necessary prior to inspection at the intermediate points.

Approximately 15 degrees



Approximately 30 degrees

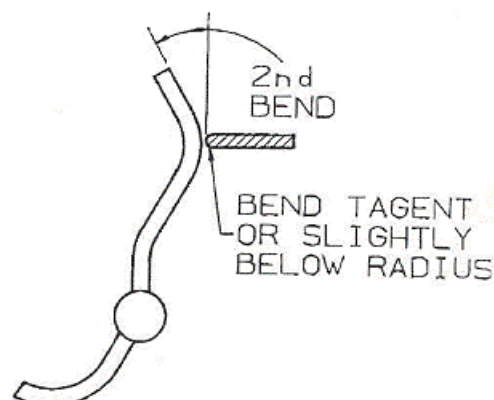


Figure 3-6. S&K pin adjustment if reading is low at 60 mmHg.

Note: In all adjustments during calibration, the gear sector starting position will affect accuracy. Sometimes, this alone can be used as an individual adjustment to achieve conformance. Higher readings will be realized when the gear sector is extending beyond the edge of the top plate and lower readings will be realized when it is within the edge of the top plate.

28. Check for leaks by pinching off the tubing from the test equipment while pressure is applied to the gauge. There should be no leakage or movement of the pointer.

Check and finish calibration of the Wall and Mobile Aneroid

29. Remove the test pointer and test dial. Replace the gauge's dial.

30. Apply a small amount of red Loctite #266 to the pointer's hub. Place the gauge's pointer onto the pinion. Ensure the pointer is resting in center of oval "0". Gently tap the pointer with small hammer to secure or use (T112697) pointer assembly tool.

31. Place the crystal and perform a full test.

Testing of the Wall and Mobile Aneroid

32. Connect the Wall or Mobile Gauge to the test equipment.

33. Apply 320 mmHg of pressure to the gauge.

34. Release the pressure to 300 mmHg.

35. Compare the reading of wall or mobile gauge under test to a calibrated digital pressure meter.

36. The following are the pressure test points that each gauge must be tested to after any repair is made. The gauge must be accurate to within ± 3 mmHg at the following test pressures:

- a) 0 mmHg (pointer inside the oval/rectangle)
- b) 60 mmHg
- c) 100 mmHg
- d) 150 mmHg
- e) 200 mmHg
- f) 250 mmHg
- g) 300 mmHg

Note: Calibration of all gauges must be performed using a Calibrated Digital Pressure Meter as the pressure standard for complete accuracy.

Classic Hand Aneroid Gauge (Date stamp of September 2003 or earlier)

Note: Before calibrating the Classic Hand Gauge:

- a) Check the connector fitting for damage*
- b) Inspect o-ring*
- c) Check spring and ball*
- d) Move thumb screw and check for uniform movement*
- e) Check movement for damage.*

Replacing Parts of the Hand Gauge

1. Pull the bulb off of the valve body.
2. Place the hand gauge into the hand gauge fixture (T107569).
3. Remove the bezel by unscrewing it counter clockwise from the case. Remove the crystal.
4. Remove the pointer by using the pointer removal tool (T18814).
5. Pry out the dial by using a small flat head screwdriver.
6. Remove the cover of the hand gauge by unscrewing the two cover screws with a phillips head screwdriver.
7. Loosen the locking nut from the capsule. Remove both from the case.
8. Remove the movement screws from the case. Remove the movement from the case.
9. Remove the thumbscrew using tool (T113265 thumbscrew wrench). Turn the thumbscrew counter clockwise to remove.
10. Remove the thumbscrew valve body using a 5/8" socket.

Note: Reassemble in reverse order.

Calibration of the Classic Hand Gauge

11. Connect the gauge to the test equipment.
12. Ensure that the valve of the gauge is closed. Place the gauge in to fixture (T107569).
13. Increase the pressure to 250 mmHg. Allow the pressure to stabilize for 15 seconds. Check for a leak.
14. Remove the bezel, crystal, pointer and dial.

Aligning the Sector Gear on the Classic Hand Gauge

15. Tighten all screws.
16. View the sector gear and ensure proper position. The sector gear is in the proper position when the right edge of the sector gear is aligned with the mark on the base of the movement.
17. If the sector gear not aligned properly, remove the two cover screws. Loosen the capsule nut using a 3/8" wrench. Adjust the sector gear using a 5/16 wrench. Turn the capsule sector gear until is in the correct position per step 16. Tighten capsule nut.

To set the tension of the Classic Hand Gauge

18. Loosen the sector stop lug and pull it towards the bottom of gauge.
19. Using your left index finger, push the sector gear all the way to the post and hold it in that position.
20. Place the tension setting tool (T119628) onto pinion at the 9 o'clock position.
21. Rotate the tool clock wise to the 5 o'clock position.
22. Release the sector gear and continue rotation to the 9 o'clock position. The sector gear should be moving during this step.
23. Bring the lug back to the correct position and lock it into place.

Setting the span of the Classic Hand Gauge

24. Place the test dial (T105721) onto the gauge. Place the test pointer onto the pinion. Rotate the dial until the pointer is at pointing at "0".
25. Apply 320 mmHg of pressure to the gauge.
26. Bleed the pressure down to 300 mmHg.
27. If the pointer is pointing to less than "300", place the calibration tool (T106845A) into the radius plate slot above screw. Rotate the calibration tool counter clockwise towards the bottom of the gauge until the sector gear pointer reaches "300". Release the pressure to 0 mmHg and check at the "0" point.
28. If the pointer is pointing to greater than "300", using the calibration tool (T106845A) positioned between the sector gear and the radius plate. Rotate the tool clockwise until the pointer is at "300" (this brings the radius plate down). Release the pressure to 0 mmHg and check the "0" point.

29. If the pointer is not at "0" upon the release of pressure, rotate the test dial until the pointer is on the "0" mark of test dial. Repeat steps 25-28 until the span is set.

Check and finish calibration of the Classic Hand Gauge

30. Remove the test pointer and test dial. Replace the gauge's dial.

31. Apply a small amount of red Loctite #266 to the hub of the pointer. Place the pointer onto the pinion and ensure it is resting in center of oval "0". Gently tap the pointer with a small hammer to secure.

32. If the pointer is to the left of the oval/square's center, rotate the pointer counter clockwise until you feel a slight resistance. Release the pointer. Ensure the pointer returns to the center of the oval/square "0". Repeat until correct.

33. If the pointer is to the right of the oval/square's center, rotate the pointer clockwise until a slight resistance is felt. Release the pointer. Ensure the pointer returns to the center of the oval/square "0" each time. Repeat until correct.

34. Place the crystal and bezel back onto the gauge and check.

Testing of the Classic Hand Gauge

35. Connect the hand gauge to the test equipment.

36. Apply 320 mmHg of pressure to the gauge.

37. Release the pressure to 300 mmHg.

38. Compare the reading of the gauge to that of the calibrated digital pressure meter.

Test Specifications

39. The following are the pressure test points that each gauge must be tested to after any repair is made. The gauge must be accurate to within ± 3 mmHg at the following test pressures:

- a) 0 mmHg (pointer inside the oval/rectangle)
- b) 60 mmHg
- c) 100 mmHg
- d) 150 mmHg
- e) 200 mmHg
- f) 250 mmHg
- g) 300 mmHg

Note: Calibration of all gauges must be performed using a Calibrated Digital Pressure Meter as the pressure standard for complete accuracy.

Classic Hand Aneroid Gauge (Date stamp of October 2003 or later)

Note: *Before calibrating the Classic Hand Gauge:*

- a) *Check pointer movement for sticky or jumpy movement*
- b) *Check for bent pinion.*
- c) *On gages with air release valve, check air release valve function.*
- d) *Connect to test equipment and check for a leak.*
- e) *Pump bulb to indicate between 250-300 mmHg. Actuate air release valve by partially depressing button and observe for controllable deflation rate.*
- f) *Fully depress button and observe for rapid dump rate (should be immediate).*
- g) *On gages with button, check button function.*

Replacing Parts of the Classic Hand Gauge

1. Pull the bulb off of the valve body.
2. Place the hand gauge into the hand gauge fixture (T107569).
3. Remove the bezel by unscrewing it counter clockwise from the case. Remove the crystal.
4. Remove the pointer by using the pointer removal tool (T18814).
5. Pry out the dial by using a small flat head screwdriver.
6. Remove the thumbscrew using tool (T113265 thumbscrew wrench). Turn the thumbscrew counter clockwise to remove.
7. Remove the thumbscrew valve body using a 5/8" socket.

Note: *Reassemble in reverse order. Ensure you tighten the movement down with torque wrench (T18904) using adapter (T18891)*

Calibration of the Classic Hand Gauge

8. Connect the gauge to the test equipment.
9. Ensure that the valve of the gauge is closed.
10. Increase the pressure to 250 mmHg. Allow the pressure to stabilize for 15 seconds. Check for a leak.
11. Remove the bezel, crystal, pointer and dial.

Checking the Classic Hand Gauge Span

12. Place the test dial (T18781) onto the gauge. Place the test pointer onto the pinion. Rotate the test dial until the pointer is at "0".

13. Apply 320 mmHg to the Gauge.
14. Release the pressure to 300 mmHg.
15. Observe the position of the pointer. If the pointer does not align with the "300", go to **Average Zero Starting Position**.
16. If the pointer does align with "300", go to **Linearity Adjustment of the Classic Hand Aneroid**.

Average Zero Starting Position

17. Apply 60 mmHg of pressure to the gauge. Release the pressure to zero. Mentally note where the test pointer is pointing on the test dial.
18. Apply a -20 mmHg of vacuum to the gauge. Release the pressure to zero. Mentally note where the test pointer is pointing on the test dial.
19. Take the average of where the pointer was between step 17 and step 18. Rotate the test dial's zero mark to that averaged position.

Span Adjustment of the Classic Hand Aneroid

20. Apply 320 mmHg of pressure to the gage to then bleed down to 300 mmHg. Note position and maintain pressure.
21. If the span is too low, using calibration tool (T18816), bend the adjustment pin away from pinion parallel to gear sector arm. Change pressure to 0. Make sure to re-adjust the test dial so that the pointer will be slightly left of the graduation line. Re-pressurize to 320 mmHg then to 300 mmHg to evaluate the effects of the adjustment.
22. If the span is too high, using calibration tool (T18816), bend the adjustment pin towards the pinion parallel to the gear sector when pressurized at 300 mmHg. Change the pressure to 0. Make sure to re-adjust the test dial so that the pointer will be slightly left of the graduation line. Re-pressurize to 320 mmHg then to 300 mmHg to evaluate effects of adjustment. See Figure 3-7.
23. Repeat the above steps as required to obtain correct span adjustment.

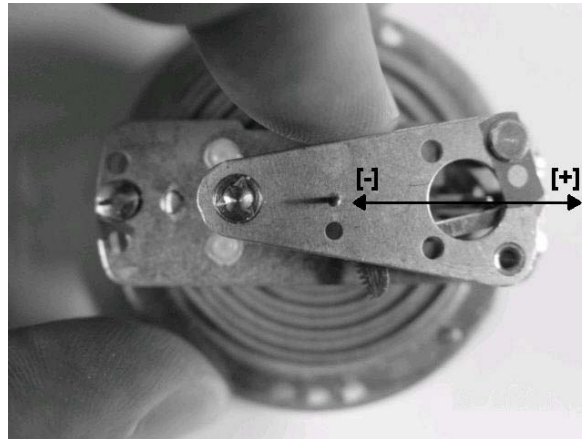


Figure 3-7. S&K span adjustment.

Linearity Adjustment of the Classic Hand Aneroid: (As required)

Note: If the 0 mmHg and 300 mmHg position are correct, and the other points at 250 mmHg or 60 mmHg are either too high or too low, then perform the following adjustments.

High Readings of the Wall/Mobile Aneroid: (Predominantly at 250 and 200)

24. Remove the test pointer and test dial. Position the calibration tool (T18816) over the adjusting pin and push it down to the cross shaft. Move the gear sector with your finger of other hand to allow access. Rotate the pin by pushing the sector gear, to move the hook away from the diaphragm (approximately 15 degrees). While maintaining this position, lift the tool up from cross shaft approximately 1/16 inch and bend the pin back approximately 15 degrees. See Figure 3-8. Lift the calibration tool up to the point where the pin makes contact with the gear sector and bend the pin up, approximately 30 degrees.

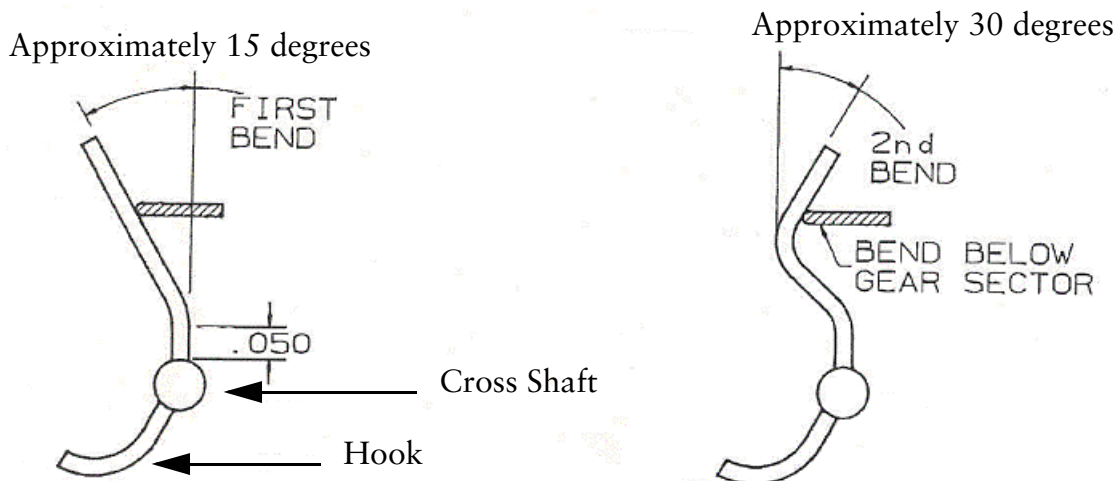


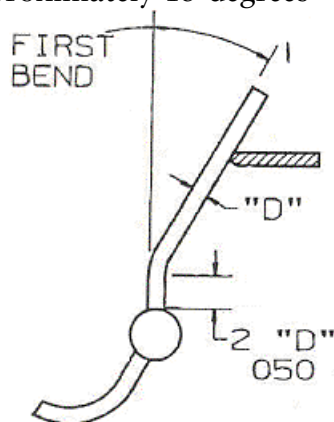
Figure 3-8. S&K pin adjustment if reading is high at 250 mmHg.

25. Remove the tool and release the gear sector. The resultant bend should result in the gear sector starting position being a max. of 2 teeth extending beyond the top plate when viewed from a top position and a minimum of 2 teeth within the edge of the top plate. (This must be checked by pushing the gear sector 2 teeth from the other side of the top plate). Adjust the secondary bend if the gear sector is out of these limits. Re-assemble the test dial and test pointer. Recheck span and adjust as necessary prior to inspecting the intermediate points.

Low Readings of the Classic Hand Aneroid at 60 or 100

26. Remove the test pointer and test dial. Position the calibration tool over the adjusting pin and push it down to the cross shaft. Lift the tool approximately 1/16 inch and bend the pin approximately 15 degrees. See Figure 3-9. While maintaining this position, lift the tool to point where the pin makes contact with the gear sector. Bend the pin down 30 degrees. Remove the tool and release the gear sector. Check for gear sector starting position as defined previously. Adjust if necessary. Re-assemble the test dial and test pointer. Recheck the span and adjust as necessary prior to inspection at the intermediate points.

Approximately 15 degrees



Approximately 30 degrees

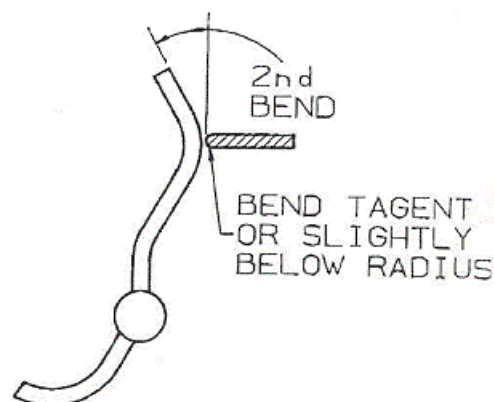


Figure 3-9. S&K pin adjustment if reading is low at 60 mmHg.

Note: In all adjustments during calibration, the gear sector starting position will affect accuracy. Sometimes, this alone can be used as an individual adjustment to achieve conformance. Higher readings will be realized when the gear sector is extending beyond the edge of the top plate and lower readings will be realized when it is within the edge of the top plate.

27. Check for leaks by pinching off the tubing from the test equipment while pressure is applied to the gauge. There should be no leakage or movement of the pointer.

Check and finish the calibration of the Classic Hand Gauge

28. Remove the test pointer and test dial. Replace the gauge's dial.

29. Apply a small amount of red Loctite #266 to the hub of the pointer. Place the gauge's pointer onto the pinion. Ensure that it is resting in the center of the oval. Gently tap the pointer with small hammer to secure or use (T112697) pointer assembly tool.

30. Place the crystal and bezel back onto the gauge and test the gauge.

31. The following are the pressure test points that each gauge must be tested to after any repair is made. The gauge must be accurate to within ± 3 mmHg at the following test pressures:

- a) 0 mmHg (pointer inside the oval/rectangle)
- b) 60 mmHg
- c) 100 mmHg
- d) 150 mmHg
- e) 200 mmHg
- f) 250 mmHg
- g) 300 mmHg

***Note:** Calibration of all gauges must be performed using a Calibrated Digital Pressure Meter as the pressure standard for complete accuracy.*

Economy Aneroid Gauge (Stopped production on 7/15/03)

Note: *Before performing calibration:*

- a) *Check the clip for correct tension. Replace before calibration.*
- b) *Ensure the lock nut is tight.*
- c) *Check the hair spring. Ensure that the hair spring is uniform and not distorted.*
- d) *Check the pinion. Ensure that it rotates correctly and is not bent.*

Replacing Parts of the Economy Gauge

1. Remove the two screws from the back of the case using a phillips head screwdriver.
2. Remove the Economy cover and the crystal.
3. Remove the pointer using the pointer removal tool (T18814).
4. Pry the dial from the case using a small flat head screwdriver.
5. Remove the movement from the case using (T108897).
6. Loosen the screw from the case using (T105258) and remove the capsule.

Note: *Reassemble in reverse order. Use 3M Plastic Adhesive #1099 to secure the dial onto the case.*

Calibration of the Economy Gauge

7. Connect the gauge to the test equipment.
8. Place the gauge in to fixture (T108212)
9. Remove the bezel, crystal, pointer and dial.

Aligning the Sector Gear of the Economy Gauge

10. Tighten all screws.
11. View the sector gear and ensure it is in the proper position. The right edge of sector gear should align with the mark on base of the movement.
12. If the sector gear not aligned properly, loosen the capsule nut using wrench (T105258). Adjust the sector gear by turning the capsule until sector gear is in correct position per step #11. Tighten the capsule nut.

Setting the tension of the Economy Gauge

13. Loosen the sector stop lug with (T112772) and pull it towards the bottom of the gauge.

14. Using your left index finger, push the sector gear all the way to the post and hold it in that position.
15. Place the tension setting tool (T119628) onto the pinion at the 9 o'clock position.
16. Rotate the tool clock wise to the 5 o'clock position.
17. Release the sector gear and continue rotation to the 9 o'clock position. The sector gear should be moving during this step.
18. Bring the lug back to the correct position and lock it into place.

Setting the span of the Economy Gauge

19. Place the test dial (T110657) onto the gauge. Place the test pointer onto the pinion. Rotate the dial until the pointer is at "0" (the bottom of the gauge).
20. Apply 320 mmHg of pressure to the gauge.
21. Bleed the pressure down to 300 mmHg.
22. If the pointer is pointing to less than "300", place the calibration tool (T106845A) into the radius plate slot above screw. Rotate the calibration tool counter clock-wise towards the bottom of the gauge until the sector gear pointer reaches "300". Release the pressure to 0 mmHg and check at the "0" point.
23. If the pointer is pointing to greater than "300", position the calibration tool (T106845A) between the sector gear and the radius plate. Rotate the tool clock wise until the pointer is at "300" (this brings the radius plate down). Release the pressure to 0 mmHg and check the "0" point.
24. If the pointer is not at "0" upon release of pressure, rotate the test dial until the pointer is on the "0" mark of test dial. Repeat steps 20-23 until the span is set.
25. Check for leaks by pinching off the tubing from the test equipment while pressure is applied to the gauge. There should be no visible leak.

Check and finish calibration of the Economy Gauge:

26. Remove the test pointer and test dial. Replace the gauge's dial. *Use 3M Plastic Adhesive #1099 to secure the dial onto the case.*
27. Apply a small amount of red Loctite #266 to the hub of the pointer. Place the gauge's pointer onto the pinion. Rest the pointer in the center of the oval/square. Gently tap the pointer with a small hammer to secure the pointer.

28. If the pointer is to the left of the oval/square's center, rotate the pointer counter clockwise until you feel a slight resistance. Release the pointer. Ensure the pointer returns to the center of the oval/square "0". Repeat until correct.

29. If the pointer is to the right of the oval/square's center, rotate the pointer clockwise until a slight resistance is felt. Release the pointer. Ensure the pointer returns to the center of the oval/square "0" each time. Repeat until correct.

30. Place the crystal and bezel back onto the gauge and test.

Testing of the Economy Gauge

31. Connect the economy gauge to be tested to the test equipment.

32. Apply 320 mmHg of pressure to the gauge.

33. Release the pressure to 300 mmHg.

34. Compare the reading of the gauge to that of the calibrated digital pressure meter.

Test Specifications

35. The following are the pressure test points that each gauge must be tested to after any repair is made. The gauge must be accurate to within ± 3 mmHg at the following test pressures:

- a) 0 mmHg (pointer inside the oval/rectangle)
- b) 60 mmHg
- c) 100 mmHg
- d) 150 mmHg
- e) 200 mmHg
- f) 250 mmHg
- g) 300 mmHg

Note: Calibration of all gauges must be performed using a Calibrated Digital Pressure Meter as the pressure standard for complete accuracy.

TR-1 Silver Ring Hand Aneroid

Replacing Parts of the Silver Ring

1. Unscrew the bulb from the gauge.
2. Place a screwdriver under the bezel in the opening provided and lift the bezel.
3. Place a screwdriver under the crystal in the opening provided and lift the crystal.
4. Using the (T18814) pointer removal tool, remove the pointer from the pinion.
5. Remove the dial from the housing.
6. Remove the movement using (T19035) movement removal tool.
7. Remove the movement internal housing. (Pry loose with a jewlers screwdriver)
8. Remove the valve body-trigger module.

***Note:** Reassemble in reverse order. Ensure you tighten the movement down with torque wrench (T18904) using adapter (T18891).*

Calibration of the Silver Ring Hand Aneroid

9. Attach the air supply to the gauge with a luer fitting.
10. Position the test dial and test pointer on gage.
11. Apply 300 mmHg of pressure to the gauge. View the gauge and ensure the gauge leaks no greater than 10 mmHg in 5 seconds.

Checking the Silver Ring Gauge Span

12. Place the test dial (T19036) onto the gauge. Place the test pointer onto the pinion. Rotate the test dial until the pointer is at "0".
13. Apply 320 mmHg to the Gauge.
14. Release the pressure to 300 mmHg.
15. Observe the position of the pointer. If the pointer does not align with the "300", goto **Average Zero Starting Position**.
16. If the pointer does align with "300", goto **Linearity Adjustment of the Silver Ring Aneroid**.

Average Zero Starting Position

17. Apply 60 mmHg of pressure to the gauge. Release the pressure to zero. Mentally note where the test pointer is pointing on the test dial.
18. Apply a -20 mmHg of vacuum to the gauge. Release the pressure to zero. Mentally note where the test pointer is pointing on the test dial.
19. Take the average of where the pointer was between step 17 and step 18. Rotate the test dial's zero mark to that averaged position.

Span Adjustment of the Silver Ring Aneroid

20. Apply 320 mmHg of pressure to the gage to then bleed down to 300 mmHg. Note position and maintain pressure.
21. If the span is too low, using calibration tool (T18816), bend the adjustment pin away from pinion parallel to gear sector arm. Change pressure to 0. Make sure to re-adjust the test dial so that the pointer will be slightly left of the graduation line. Re-pressurize to 320 mmHg then to 300 mmHg to evaluate the effects of the adjustment.
22. If the span is too high, using calibration tool (T18816), bend the adjustment pin towards the pinion parallel to the gear sector when pressurized at 300 mmHg. Change the pressure to 0. Make sure to re-adjust the test dial so that the pointer will be slightly left of the graduation line. Re-pressurize to 320 mmHg then to 300 mmHg to evaluate effects of adjustment. See Figure 3-10.
23. Repeat the above steps as required to obtain correct span adjustment.

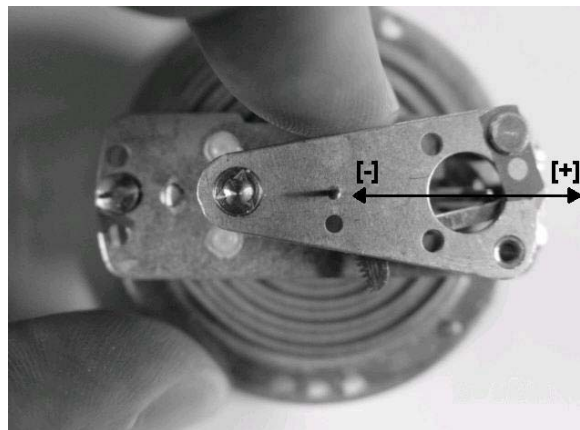


Figure 3-10. S&K span adjustment.

Linearity Adjustment of the Silver Ring Aneroid: (As required)

Note: If the 0 mmHg and 300 mmHg position are correct, and the other points at 250 mmHg or 60 mmHg are either too high or too low, then perform the following adjustments.

High Readings of the Silver Ring Aneroid: (Predominantly at 250 and 200)

24. Remove the test pointer and test dial. Position the calibration tool (T18816) over the adjusting pin and push it down to the cross shaft. Move the gear sector with your finger of other hand to allow access. Rotate the pin by pushing the sector gear, to move the hook away from the diaphragm (approximately 15 degrees). While maintaining this position, lift the tool up from cross shaft approximately 1/16 inch and bend the pin back approximately 15 degrees. See Figure 3-11. Lift the calibration tool up to the point where the pin makes contact with the gear sector and bend the pin up, approximately 30 degrees.

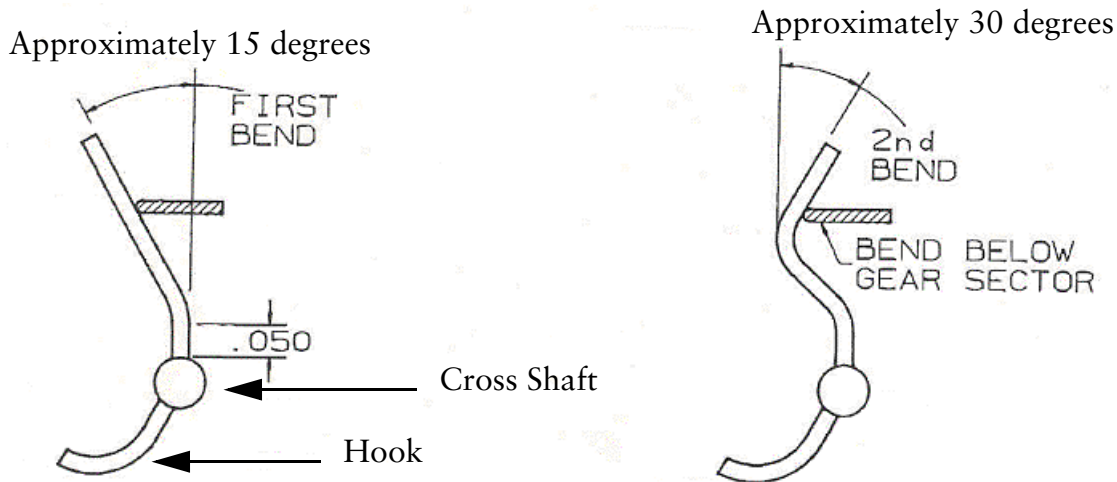


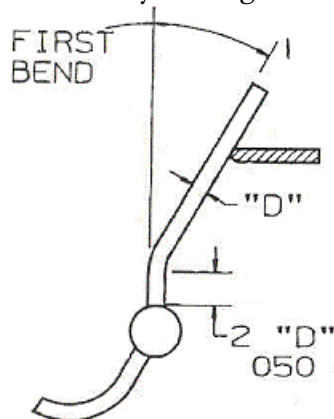
Figure 3-11. S&K pin adjustment if reading is high at 250 mmHg.

25. Remove the tool and release the gear sector. The resultant bend should result in the gear sector starting position being a max. of 2 teeth extending beyond the top plate when viewed from a top position and a minimum of 2 teeth within the edge of the top plate. (This must be checked by pushing the gear sector 2 teeth from the other side of the top plate). Adjust the secondary bend if the gear sector is out of these limits. Re-assemble the test dial and test pointer. Recheck span and adjust as necessary prior to inspecting the intermediate points.

Low Readings of the Silver Ring Aneroid at 60 or 100

26. Remove the test pointer and test dial. Position the calibration tool over the adjusting pin and push it down to the cross shaft. Lift the tool approximately 1/16 inch and bend the pin approximately 15 degrees. See Figure 3-12. While maintaining this position, lift the tool to point where the pin makes contact with the gear sector. Bend the pin down 30 degrees. Remove the tool and release the gear sector. Check for gear sector starting position as defined previously. Adjust if necessary. Re-assemble the test dial and test pointer. Recheck the span and adjust as necessary prior to inspection at the intermediate points.

Approximately 15 degrees



Approximately 30 degrees

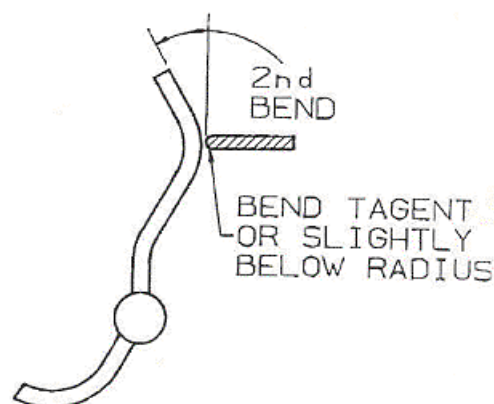


Figure 3-12. S&K pin adjustment if reading is low at 60/100 mmHg.

Note: In all adjustments during calibration, the gear sector starting position will affect accuracy. Sometimes, this alone can be used as an individual adjustment to achieve conformance. Higher readings will be realized when the gear sector is extending beyond the edge of the top plate and lower readings will be realized when it is within the edge of the top plate.

27. Check for leaks by pinching off the tubing from the test equipment while pressure is applied to the gauge. There should be no leakage or movement of the pointer.

Check and finish the calibration of the Silver Ring Gauge

28. Remove the test pointer and test dial. Replace the gauge's dial.

29. Apply a small amount of red Loctite #266 to the hub of the pointer. Place the gauge's pointer onto the pinion. Ensure that it is resting in the center of the oval. Gently tap the pointer with small hammer to secure or use (T112697) pointer assembly tool.

30. Place the crystal and bezel back onto the gauge and test the gauge.

31. The following are the pressure test points that each gauge must be tested to after any repair is made. The gauge must be accurate to within ± 3 mmHg at the following test pressures:

- a) 0 mmHg (pointer inside the oval/rectangle)
- b) 60 mmHg
- c) 100 mmHg
- d) 150 mmHg
- e) 200 mmHg
- f) 250 mmHg
- g) 300 mmHg

Note: Calibration of all gauges must be performed using a Calibrated Digital Pressure Meter as the pressure standard for complete accuracy.

TR-2 Pro Check Hand Aneroid

Replacing Parts on Pro Check Hand Aneroid

1. Insert a screwdriver at bottom of the crystal and pry out crystal.
2. Loosen and remove pointer using (T18814).
3. Insert the screwdriver at the bottom of the dial and remove the dial from the gauge.
4. Unscrew the complete base plate with the movement and remove the washer using T112833 movement removal tool.

Note: Reassemble in reverse order. Ensure you tighten the movement down with torque wrench (T18904) using adapter (T18891)

Calibration of the Pro Check Hand Aneroid

5. Connect the gauge to the air supply with luer fitting
6. Position test dial and test pointer on the gage.
7. Apply 300 mmHg of pressure. View the gauge and ensure the leak is no greater than 10 mmHg in 5 seconds.

Checking the Pro Check Hand Gauge Span

8. Place the test dial (T112949) onto the gauge. Place the test pointer onto the pinion. Rotate the test dial until the pointer is at "0".
9. Apply 320 mmHg to the Gauge.
10. Release the pressure to 300 mmHg.
11. Observe the position of the pointer. If the pointer does not align with the "300", go to **Average Zero Starting Position**.
12. If the pointer does align with "300", goto **Linearity Adjustment of the Pro Check Hand Aneroid**.

Average Zero Starting Position

13. Apply 60 mmHg of pressure to the gauge. Release the pressure to zero. Mentally note where the test pointer is pointing on the test dial.
14. Apply a -20 mmHg of vacuum to the gauge. Release the pressure to zero. Mentally note where the test pointer is pointing on the test dial.

15. Take the average of where the pointer was between step 13 and step 14. Rotate the test dial's zero mark to that averaged position.

Span Adjustment of the Pro Check Hand Aneroid

16. Apply 320 mmHg of pressure to the gage to then bleed down to 300 mmHg. Note position and maintain pressure.

17. If the span is too low, using calibration tool (T18816), bend the adjustment pin away from pinion parallel to gear sector arm. Change pressure to 0. Make sure to re-adjust the test dial so that the pointer will be slightly left of the graduation line. Re-pressurize to 320 mmHg then to 300 mmHg to evaluate the effects of the adjustment.

18. If the span is too high, using calibration tool (T18816), bend the adjustment pin towards the pinion parallel to the gear sector when pressurized at 300 mmHg. Change the pressure to 0. Make sure to re-adjust the test dial so that the pointer will be slightly left of the graduation line. Re-pressurize to 320 mmHg then to 300 mmHg to evaluate effects of adjustment. See Figure 3-13.

19. Repeat the above steps as required to obtain correct span adjustment.

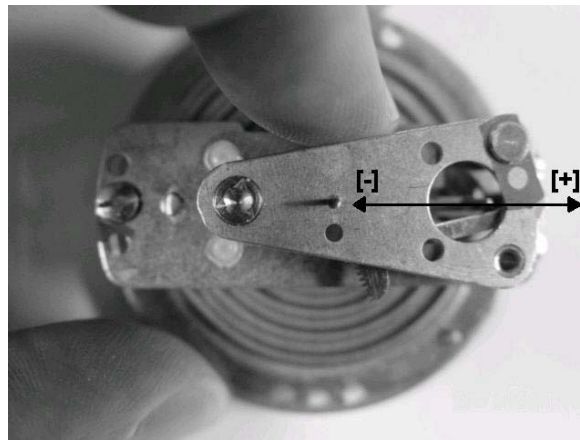


Figure 3-13. S&K span adjustment.

Linearity Adjustment of the Pro Check Hand Aneroid: (As required)

Note: If the 0 mmHg and "300 mmHg position are correct, and the other points at 250 mmHg or 60 mmHg are either too high or too low, then perform the following adjustments.

High Readings of the Pro Check Aneroid: (Predominantly at 250 and 200)

20. Remove the test pointer and test dial. Position the calibration tool (T18816) over the adjusting pin and push it down to the cross shaft. Move the gear sector with your finger of other hand to allow access. Rotate the pin by pushing the sector gear, to move the hook away from the diaphragm (approximately 15 degrees). While maintaining this position, lift

the tool up from cross shaft approximately 1/16 inch and bend the pin back approximately 15 degrees. See Figure 3-14. Lift the calibration tool up to the point where the pin makes contact with the gear sector and bend the pin up, approximately 30 degrees.

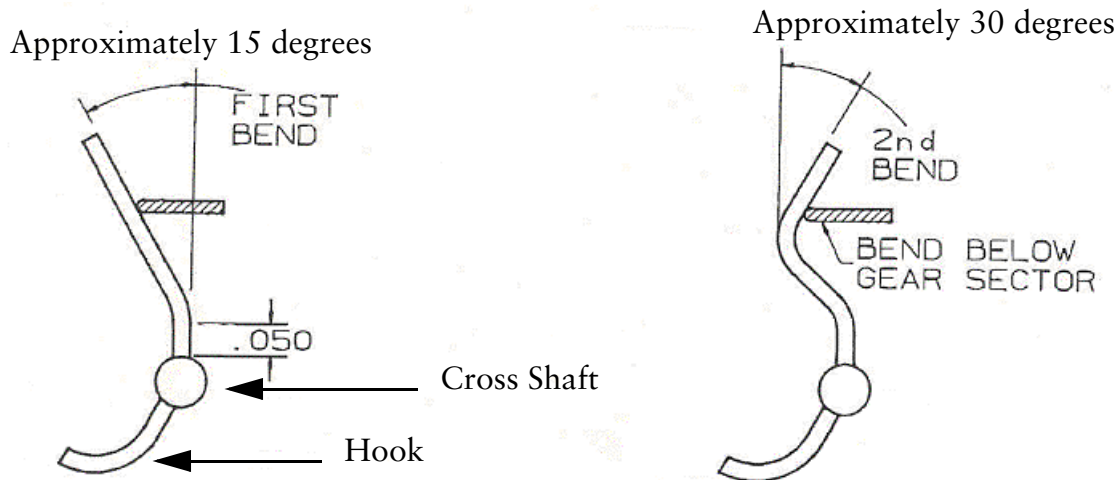


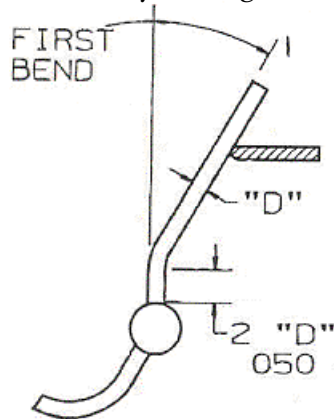
Figure 3-14. S&K pin adjustment if reading is high at 250 mmHg.

21. Remove the tool and release the gear sector. The resultant bend should result in the gear sector starting position being a max. of 2 teeth extending beyond the top plate when viewed from a top position and a minimum of 2 teeth within the edge of the top plate. (This must be checked by pushing the gear sector 2 teeth from the other side of the top plate). Adjust the secondary bend if the gear sector is out of these limits. Re-assemble the test dial and test pointer. Recheck span and adjust as necessary prior to inspecting the intermediate points.

Low Readings of the Pro Check Hand at 60 or 100

22. Remove the test pointer and test dial. Position the calibration tool over the adjusting pin and push it down to the cross shaft. Lift the tool approximately 1/16 inch and bend the pin approximately 15 degrees. See Figure 3-15. While maintaining this position, lift the tool to point where the pin makes contact with the gear sector. Bend the pin down 30 degrees. Remove the tool and release the gear sector. Check for gear sector starting position as defined previously. Adjust if necessary. Re-assemble the test dial and test pointer. Recheck the span and adjust as necessary prior to inspection at the intermediate points.

Approximately 15 degrees



Approximately 30 degrees

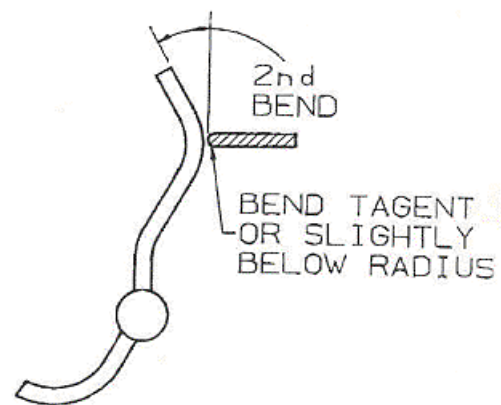


Figure 3-15. S&K pin Adjustment if reading is low at 60 mmHg.

Note: In all adjustments during calibration, the gear sector starting position will affect accuracy. Sometimes, this alone can be used as an individual adjustment to achieve conformance. Higher readings will be realized when the gear sector is extending beyond the edge of the top plate and lower readings will be realized when it is within the edge of the top plate.

23. Check for leaks by pinching off the tubing from the test equipment while pressure is applied to the gauge. There should be no leakage or movement of the pointer.

Check and finish the calibration of the Pro Check Hand Gauge

24. Remove the test pointer and test dial. Replace the gauge's dial.

25. Apply a small amount of red Loctite #266 to the hub of the pointer. Place the gauge's pointer onto the pinion. Ensure that it is resting in the center of the oval. Gently tap the pointer with small hammer to secure or use (T112697) pointer assembly tool.

26. Place the crystal and bezel back onto the gauge and test the gauge.

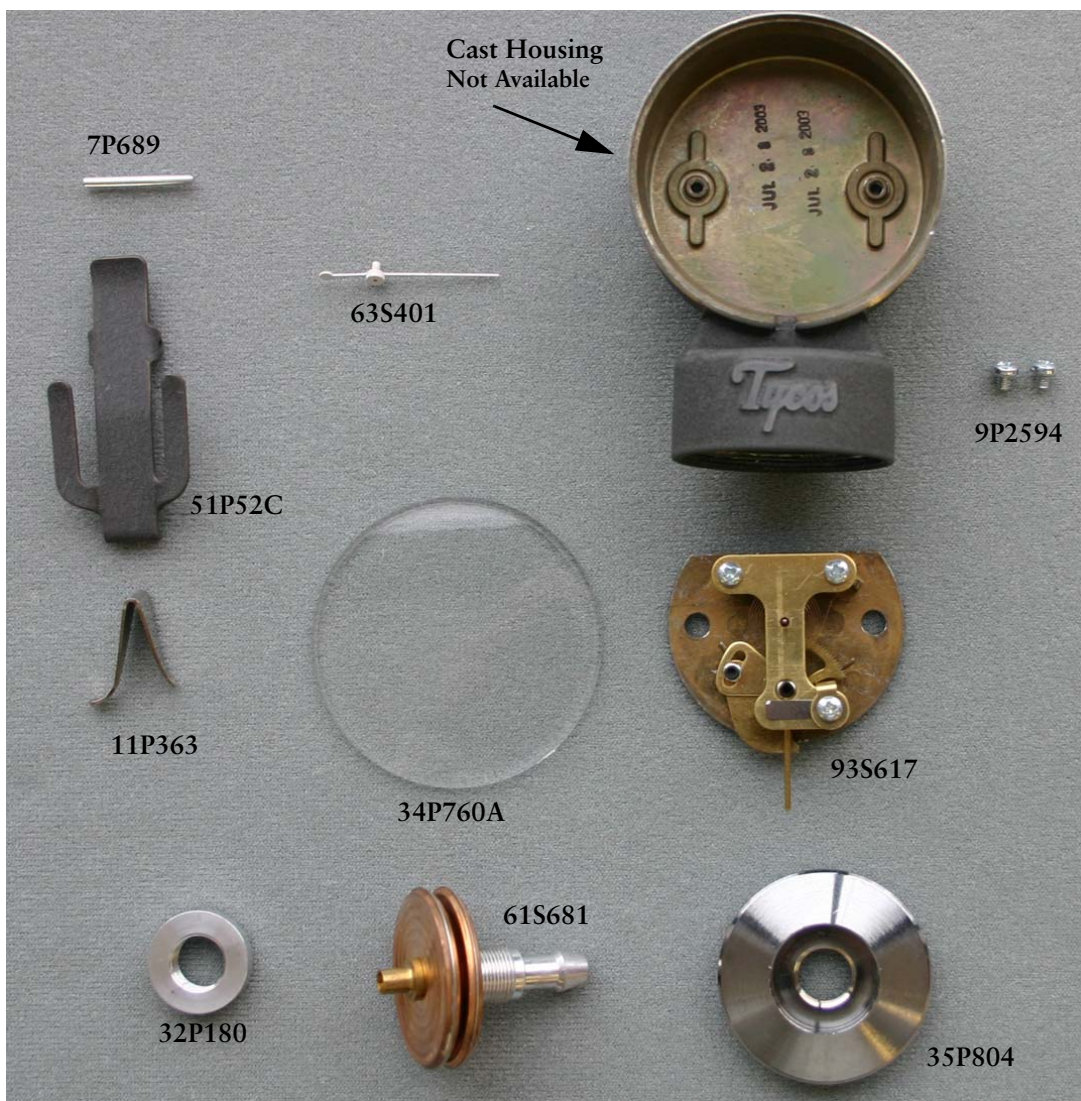
27. The following are the pressure test points that each gauge must be tested to after any repair is made. The gauge must be accurate to within ± 3 mmHg at the following test pressures:

- a) 0 mmHg (pointer inside the oval/rectangle)
- b) 60 mmHg
- c) 100 mmHg
- d) 150 mmHg
- e) 200 mmHg
- f) 250 mmHg
- g) 300 mmHg

Note: Calibration of all gauges must be performed using a Calibrated Digital Pressure Meter as the pressure standard for complete accuracy.

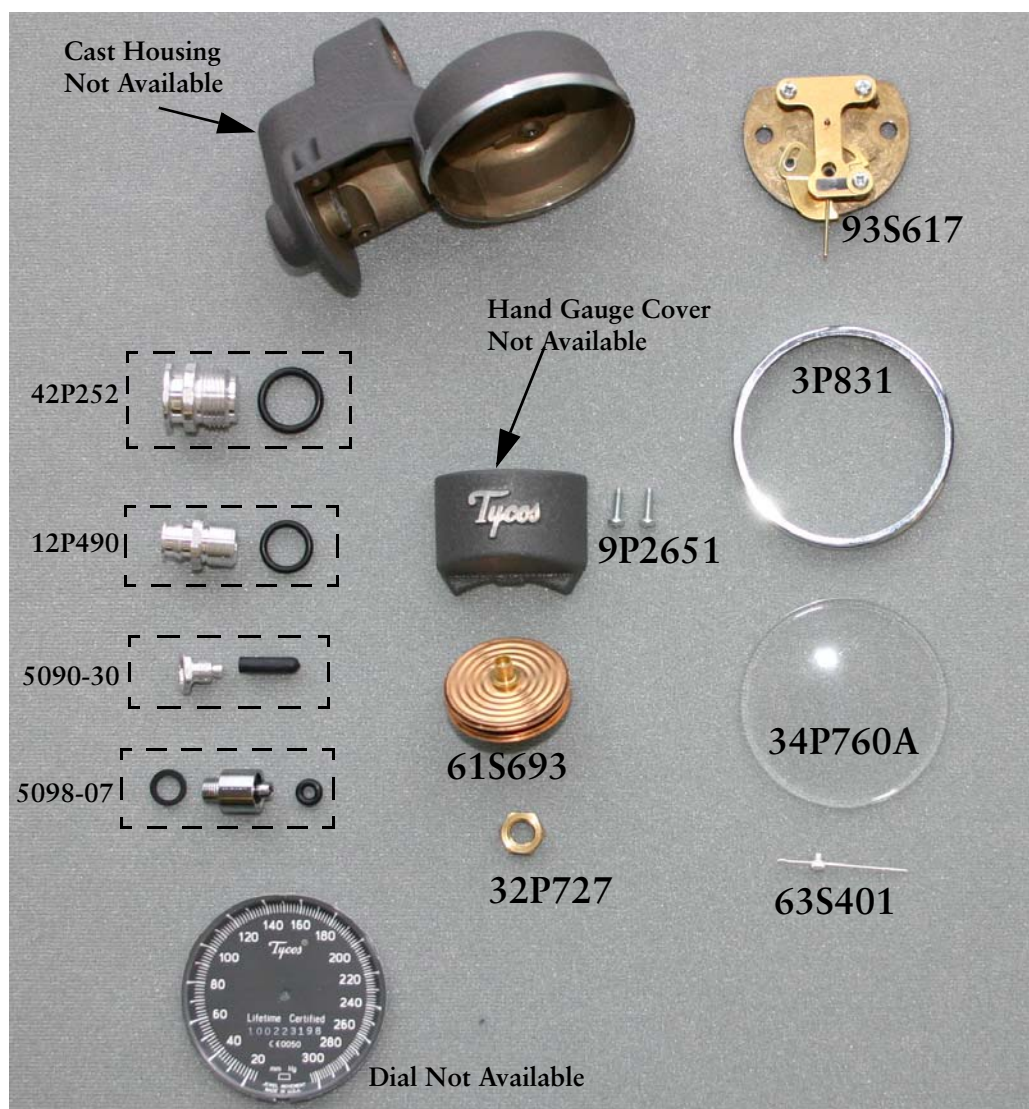
Old Style Classic Pocket Repair Parts

Part Number	Description
51P52C	Clip Assembly
32P180	Lock nut
34P760A	Crystal
3P831	Bezel
35P804	Screw cap (NS)
61S681	Diaphragm Assembly
63S401	Pointer
93S617	Movement
9P2594	Screw, Movement
11P363	Spring
7P689	Pin for Clip



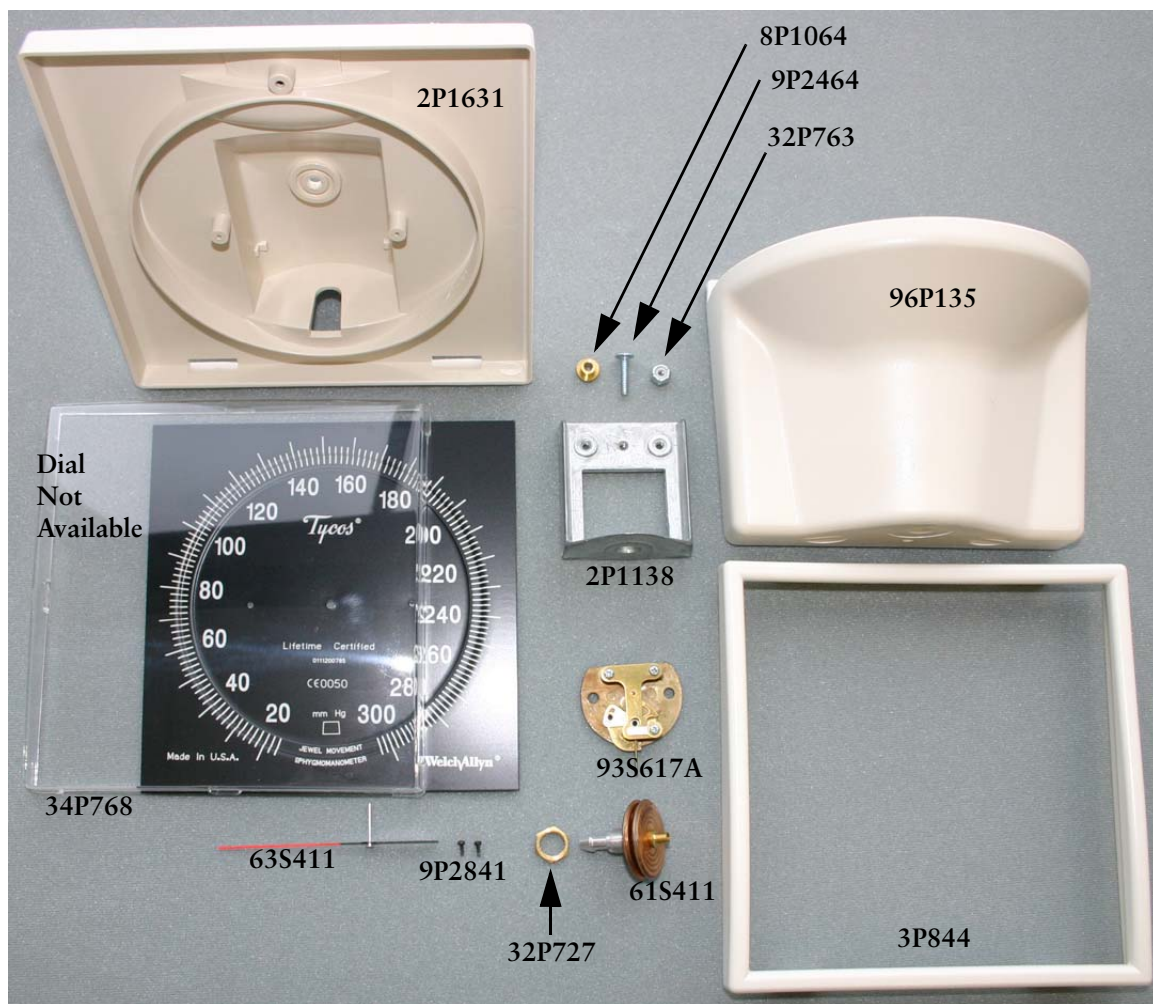
Old Style Classic Hand Repair Parts

Part Number	Description	Part Number	Description
9P2651	Screw, Cover	3P831	Bezel
9S132	Thumb Screw	34P760A	Crystal
42P252	Valve Body Assembly	63S401	Pointer
5090-30	Screen Assy/Bulb Adapter	9P2594	Screw, Movement
12P490	Bulb Adapter	93S617	Movement
5098-07	Lure Lock Set	61S694	Diaphragm Assembly
5086-01	Bulb	32P527	Lock Nut



Old Style 767 Wall Repair Parts

Part Number	Description
3P844	Bezel
34P768	Crystal
63S411	Pointer
93S617A	Movement
61S681	Diaphragm Assembly
2P1138	Mount
32P727	Nut
2P1631	Housing
32P763	Lock nut, Case - <i>Not pictured</i>
8P1064	Bushing - <i>Not pictured</i>
96P135	Basket - <i>Not pictured</i>
9P2841	Dial Mounting Screw



Old Style Classic Wall/Mobile Repair Parts

Part Number	Description		Part number	Description
2P1138	Mount		34P417	Crystal
9P1804	Spacer		9P2841	Dial Mounting Screw
61S681	Diaphragm Assembly		63S298	Pointer, USA
14P1718	Bracket		2P1503	Housing, Gray, Wall
8P949	Bracket Bushing		9P2465	Screw (Case)
32P763	Bracket Nut		22P830	Washer (Case)
93S617A	Movement			



Economy Aneroid Repair Parts

Part Number	Description
34P640	Crystal
93S618	Movement
32P727P	Jam Nut
63S401	Pointer
9P2563	Screw Housing
61S693	Capsule
9P2851	Screw, Movement



TR1 Silver Ring Repair Parts

Part Number	Description	Part Number	Description
12P368	Adapter	52P1848	Dial
75P240	O-Ring	18P192	Bulb Collar
2P1632	Housing	23P430	Bulb Adapter
33P131	Movement Cup	97S581	Bulb
70P450	Button	11P1240	Spring
7P716	Pivot Pin	42S262	Valve Body
93S720	Movement	8S61	Valve Assembly
22P1454	Washer	5090-30	Screen Assy/Bulb Adapter
34P434	Crystal	3P847	Bezel
39P505	Trim Ring	63S410	Pointer



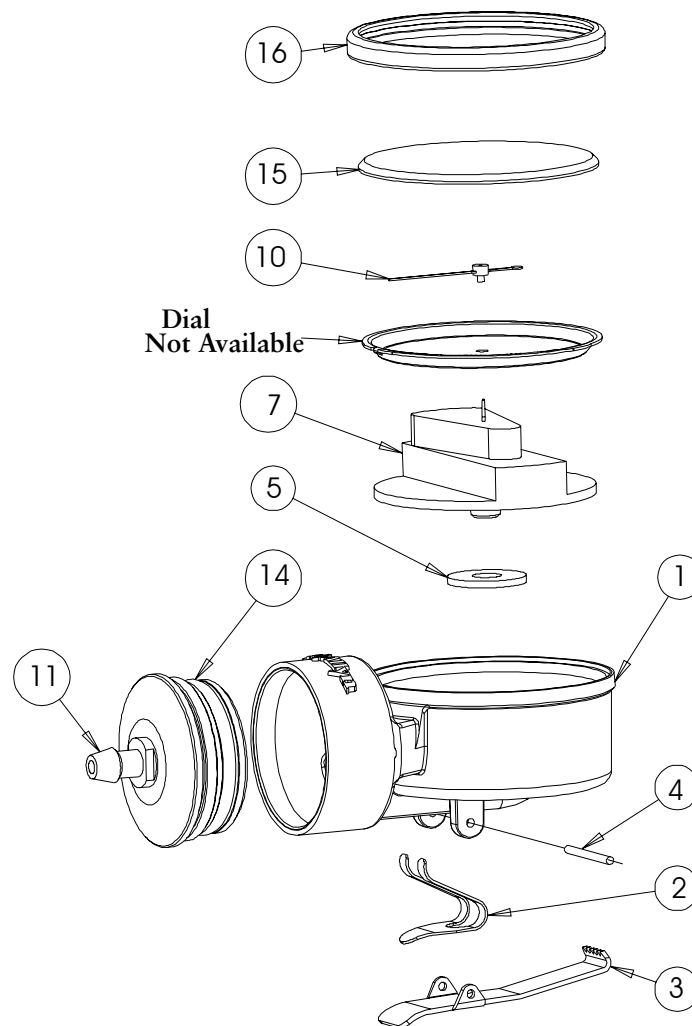
TR2 Pro Check Repair Parts

Part Number	Description
34P761	Crystal
See Note	Dial
93S720	Movement
97S583	Bulb
18P190	Bulb Ring
70P446	Trigger
8S61	Valve Assembly
11P1240	Compression Spring - <i>Not pictured</i>
See Note	Housing
See Note	Valve Body



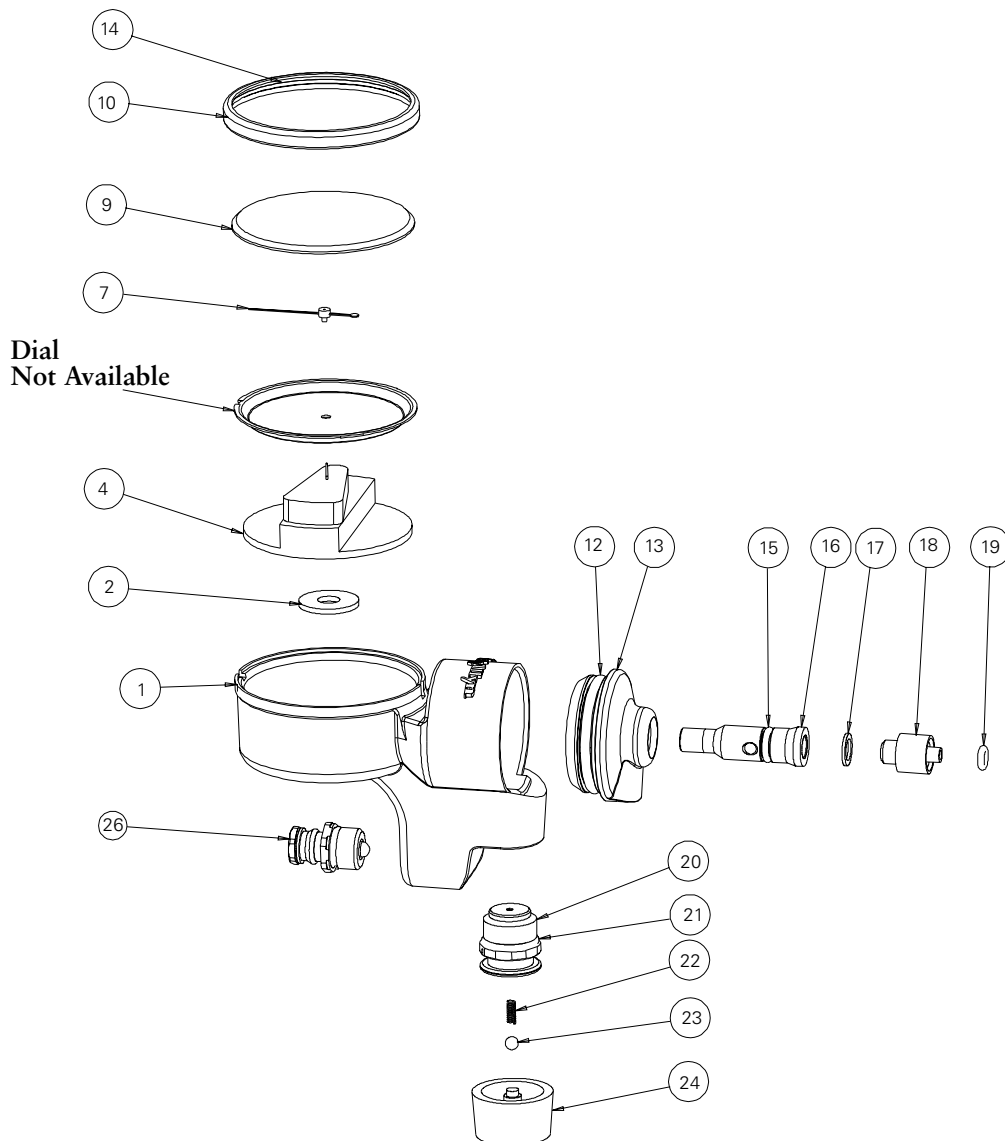
S&K Classic Pocket Repair Parts

Ref#	Part#	Description
1	590001-1	CLASSIC POCKET HOUSING W/LOGO
2	590006	SPRING, CLASSIC POCKET
3	590008	CLIP, CLASSIC POCKET
4	7P689	GROOVE PIN
5	5001915	WASHER, 16MM X 1.5MM
7	0121000SA	MOVEMENT, HAND & POCKET
8	52P1837A	GRAY 1.9 DIAL BLANK
9	590005-3	WHITE POINTER
11	590007	END CAP,POCKET
14	106108-34	O-RING
15	34P760A	CRYSTAL
16	3P831	BEZEL



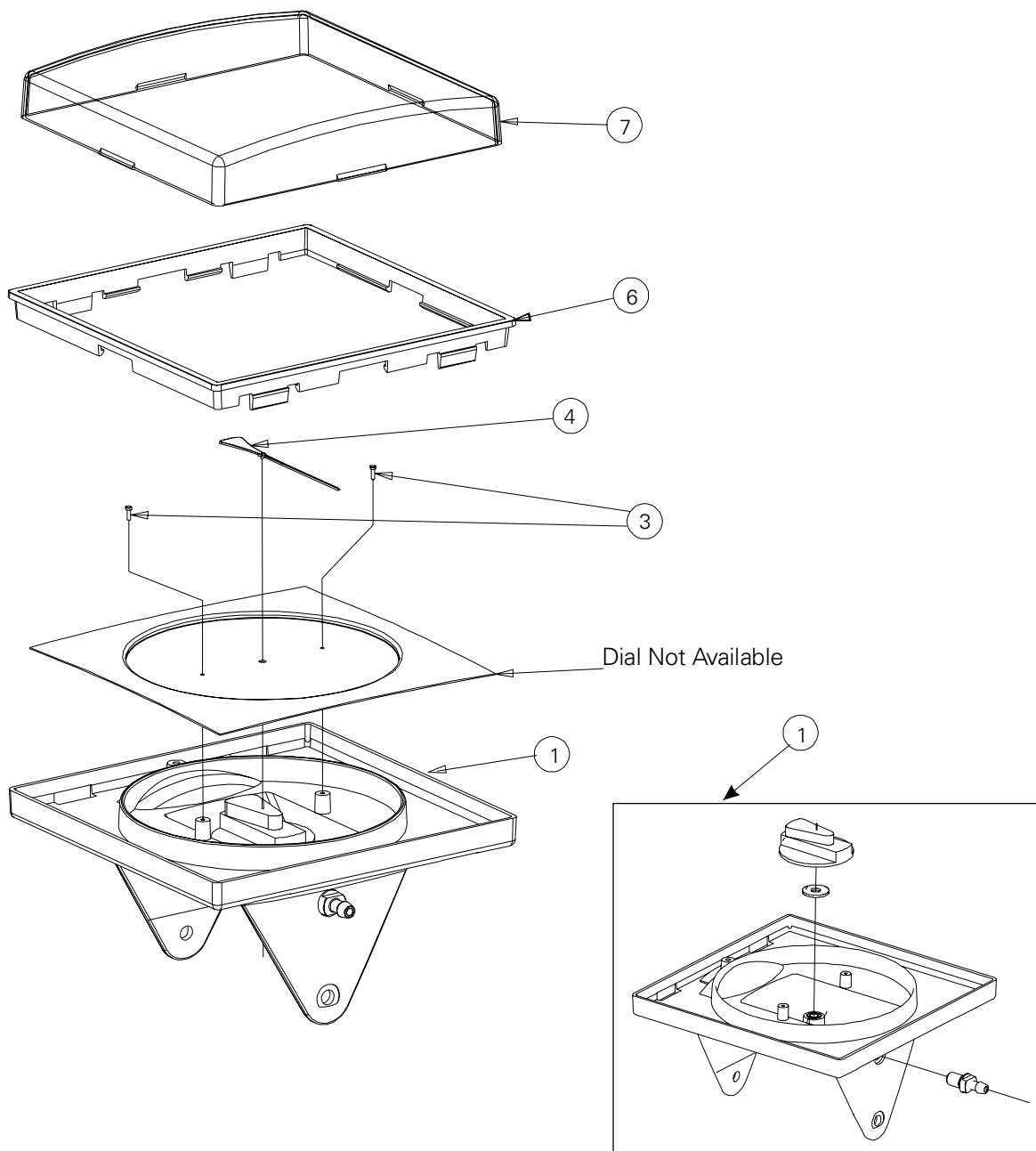
S&K Classic Hand Repair Parts

Ref#	Part#	Description	Ref#	Part#	Description
1	590104-1	CLASSIC HAND HOUSING W/LOGO	16	590111	TUBING CONNECTOR,CLASSIC HAND
2	5001915	WASHER, 16MM X 1.5MM	17	43P803	GASKET
4	0121000SA	MOVEMENT, HAND & POCKET	18	12P368	FITTING,LUER LOCK,PLATED
5	52P1837A	GRAY 1.9 DIAL BLANK	19	43P455T	O RING
7	590005-3	WHITE POINTER	20	42P252	VALVE BODY
9	34P760A	CRYSTAL	21	75P231	O-RING
10	3P831	BEZEL	22	11P1166	SPRING
12	106108-34	O-RING	23	64P494	BALL
13	590105	END CAP, CLASSIC HAND	24	9S132	THUMB SCREW
15	106108-33	O-RING	26	590101N	BULB ADAPTER SA



S&K Wall/Mobile Series 509 Repair Parts

Ref#	Part#	Description
1	590250	SUB ASSY, 5091 WALL
3	9P2841	SCREW, 0-40 X .19 PAN HEAD
4	18-87-911	POINTER, WHITE, 59MM
6	590201	BEZEL, 5091 ANEROID
7	34P417	CRYSTAL



S&K Wall 767 Series Repair Parts

Ref#	Part#	Description
1	590350	SUB ASSY, 767 WALL
3	9P2841	SCREW,0-40 X .19 PAN HEAD
4	18-87-910	POINTER,BLK/ORANGE, 59MM
6	34P768	CRYSTAL,767 ANEROID
7	3P844	BEZEL,767 ANEROID

